Engineering Library

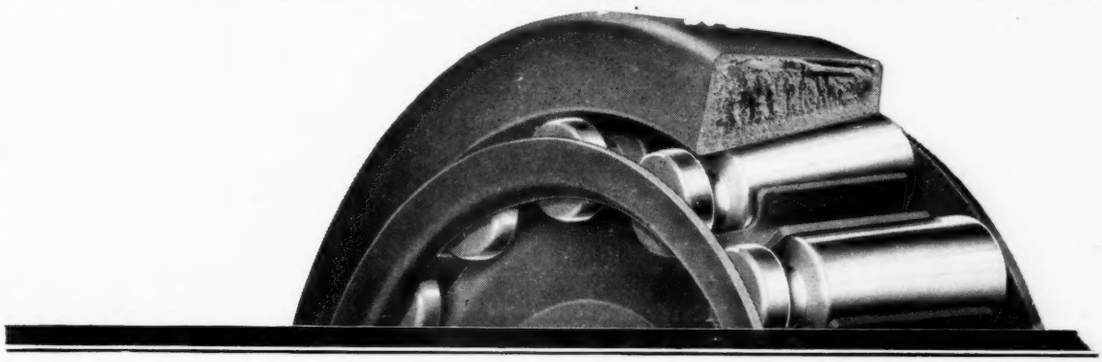
FEB 13 1922

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XLVI
Number 6

PUBLISHED WEEKLY AT 239 WEST 39th STREET
NEW YORK, FEBRUARY 9, 1922

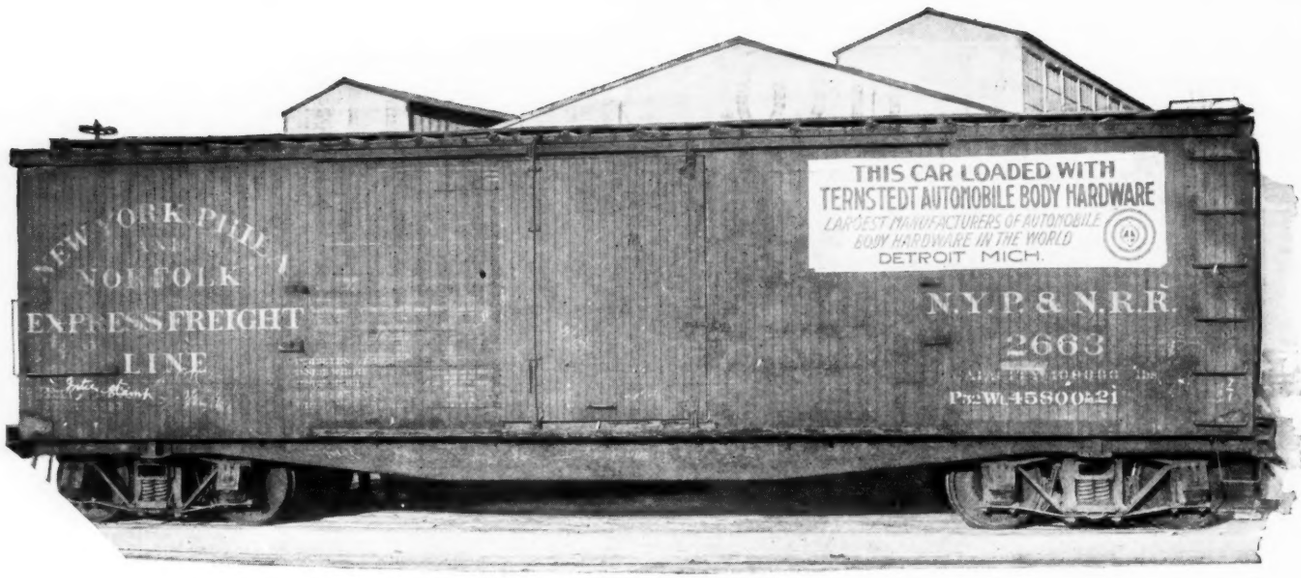
Thirty-five cents a copy
Three dollars a year



In Transmissions
and
in Differentials
and
on Pinion Shafts
and
on Worm Shafts
and
in Rear Wheels
and
in Front Wheels

TIMKEN
Tapered
ROLLER BEARINGS

Entered as second-class matter Jan. 2, 1903, at the post office at New York, N. Y., under Act of March 3, 1879.



Full Carload of Ternstedt Standardized lware Consigned to One Concern

Sufficient Equipment to Completely Outfit More Than a Thousand Automobile Bodies

..ands upon thousands of appli-..es—bumpers, anti-rattlers, hinges, ..ocks, window regulators, curtain rollers, windshields—this immense shipment consigned to one concern for installation in the bodies of a well-known make of motor cars.

Such a shipment is concrete evidence of the value of concentration in buying. Before placing their order, the concern to whom this hardware was consigned, thoroughly investigated the idea.

Good business judgment convinced them that, through centering their purchases, they would be relieved of the expense, annoyance and loss of time invariably resulting from scattered buying.

If you are not already familiar with the advantages of concentrating in Ternstedt body hardware—hardware of recognized worth and reasonable cost—let us explain them to you.

Those concerns who purchase Ternstedt equipment exclusively—and they are many—well know the sincerety of Ternstedt co-operation.

TERNSTEDT MANUFACTURING COMPANY DETROIT

Largest Manufacturers of Automobile Body Hardware In The World

Window Regulators, Curtain Rollers, Sunshades, Open and Closed Body Door Locks, Door Panels, Door Bumpers, Anti-Rattlers, Windshield Wipers, Windshields, Window Sash, Strap Hinges, Concealed Hinges,

Piano Hinges, Rear Deck Hinges, Rear Deck Locks, Rear Deck Lid Braces, Channel and Shapes, Screw Machine Products, Die-Castings. All Kinds of Stampings. Other Miscellaneous Automobile Body Hardware.

REG. U. S. PAT. OFF.

TERNSTEDT

Automobile Body Hardware

BUILT BETTER FOR BETTER BODIES

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLVI. NEW YORK—THURSDAY, FEBRUARY 9, 1922 No. 6

Many Price Cuts at Minneapolis Tractor Show

McCormick predicts price war. Many large manufacturers absent and attendance is small. Little buying expected until after next harvest. Creeper-type tractors are more prominent. Two-plow type dominates. Cletrac making own implements.

MINNEAPOLIS, MINN., Feb. 7—The National Tractor Show which opened to-day is conspicuous by the small number of exhibitors, twenty-six makes being represented as compared with seventy, two years ago. Many leading makers, including International Harvester, Fordson, Samson, Wallis, Deere, Moline, Emerson-Brantingham and Rock Island, were not present. The exhibition was the smallest on record and the attendance on the opening day was very small. Many concerns who did not favor Minneapolis refused to exhibit. For the first time tractor makers have split on a show.

Parts and accessory exhibitors were very few compared with last year. The show was held in the state fair grounds, which were very inaccessible. It might better have been held in the Overland building with the automobile show, where ample space was available, but the tractor people refused to co-operate.

The big price cuts on Fordson, Samson, Wallis, International Harvester and others are not stimulating sales as farmers are not buying, but reductions are expected to stimulate sales as spring approaches. International Harvester reduced the price of the Titan model $200 and the 8-16 Model $230. Until May 1, next, a two-furrow or three-furrow plow or a tractor disk harrow will be given with each tractor without extra charge.

The Samson tractor has been reduced from $665 to $445, thus meeting the Fordson cut of from $625 to $395. Wallis reduced the Model K from $1,250 to $995 and gives three-bottom plows without extra charge. The price last fall was $1,485.

Harold McCormick, president of the International Harvester Company, expressed the view that a price war appears inevitable. The feeling is that had the reductions now announced been made a year ago, farmers would not have gone on a prolonged buyers' strike. The farmers in the northwest are very short of money and will do little buying of cars, trucks or tractors until after the harvest. Banks refuse to make loans to farmers buying tractors. The farmers have loaned machinery to each other for the past two years and expect to continue to do so for another year or two. It may be said in general that the prospects are that farm purchases may be 20 per cent better than last year when business was not over 20 per cent of 1920. A good crop is needed to make the farmer buy.

The increased use of creeper type tractors for road construction has given impetus to this type. Two makers have creeper attachments to take the place of rear wheels on the Fordson. Avery has added a creeper type. The smaller types of tractors are gaining in popularity and the two-plow type now seems

certain to dominate the field. Fewer large tractors are being shown.

There is a growing sentiment that the National Tractor Shows should be held in Chicago, thus giving a national scope to it. Minneapolis is not central enough. If the show was held at the stock-yards in Chicago the same week as the automobile show, it would be international in scope.

Among the twenty-six makes of tractors exhibited are several new models. Parrett is showing a new cultivator, with an air-cooled V engine. This machine embodies a line drive and is designed to use existing types of implements which are ordinarily horse-drawn.

Cletrac is showing a new small model and has designed a cultivator for use with it, this being the first example of a tractor maker, not previously in implement business, designing implements. The step was necessary because implement makers had no satisfactory cultivators to offer. The extensive use of pressed steel in the cultivator is thought to indicate a new epoch in farm machinery manufacture, since it marks a departure from the old type in which castings were largely employed. The Cletrac cultivator is of the straddle row type, and is universal in character. The frame attaches to the tractor in the same way as the two-row cultivator and can be used as a frame work for planters, seeders, listers, special harrows and cultivators. By this method, it is claimed, a long list of horse-drawn implements already in use on the average farm can be economically converted to use with tractor power.

The straddle-row cultivator will be equipped for potatoes or garden truck with two adjustable gangs of a new type. The spread of the gangs and the distance between the two sets of gangs can be instantly changed from the operator's seat on the tractor.

In order to adapt its new Model F Cletrac tractor to a wider range of farm uses, the Cleveland Tractor Co. has brought out two types in addition to that described and illustrated in AUTOMOTIVE INDUSTRIES of Sept. 8 last. The original type of Model F is only 31 in. wide, which enables it to travel between rows of corn and cotton. The second type of the Model F is like the original in all respects except that it has been widened to 41 in. This change was made to secure greater stability on steep hills and rough ground. In orchards and vineyards this type can be used to advantage for pulling an ordinary disk or to push the new type of Cletrac orchard and vineyard cultivator.

THE unsatisfactory attendance at the tractor show now being held in Minneapolis and the fact that many of the prominent tractor manufacturers and parts makers are not exhibiting there makes it more and more evident that the "national" tractor show should be held annually in Chicago, preferably during the same week in which the Chicago automobile show is held. Chicago is well located geographically, so far as the tractor manufacturers are concerned, and a show held there would undoubtedly attract a large attendance.

New Types Shown

A third type uses the second or 41-in. type as a base and by means of simple attachments increases the clearance from 8 to 14 in. When making the change it is also necessary to add several track shoes and roller chain links. The primary purpose in developing a "wide and high" type was to fill the need for a practical power cultivating unit in potato and sugar beet sections and for truck gardening, which would straddle the hilled-up rows without injuring the plants or vines. The desired result has been successfully achieved.

A small tractor of the type having wheels in front and tracks in the rear has been added to the line of farm tractors of the Avery company. The machine has a rating of three 14-in. bottoms, the plowing speed being 2.66 m.p.h. The engine is a four-cylinder vertical type of 4-in. bore and 5½-in. stroke. It embodies various features which have come to be recognized as desirable in a tractor engine, such as valve-in-head construction, removable cylinder liners and a very heavy crankshaft (2¼-in. diameter). All cylinders are cast in a block. The engine is of the dual-valve type, there being 16 valves in the cylinder head. Push rods and valve levers are inclosed, and lubrication is by force feed through the hollow crankshaft.

Variety of Fuels May Be Used

A variety of fuels may be used in this tractor, including gasoline, kerosene, distillate and alcohol, but for alcohol it is essential that the compression be increased if the best fuel efficiency is desired. The main fuel tank has a capacity of 30 gal. An air cleaner is fitted, the type being optional with the purchaser. Three types are offered—namely, a dry cleaner, a water cleaner or air washer and an air cleaner comprising oil-saturated bristles. The carbureter is a double Kingston, ignition is by a Dixie double-head magneto and cooling by a centrifugal type of pump and a cellular type of radiator.

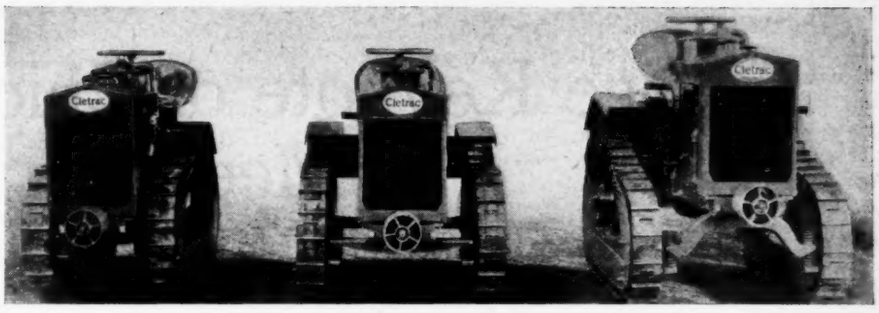
The clutch is a dry plate, toggle-locked, while the transmission is of the selective sliding gear type with all gears inclosed. This part is of Avery make. Three speeds forward are given by the transmission—namely, 1½, 2 2/3 and 3½ m.p.h. at 1000 r.p.m. of the engine. The track clutches, which are also inclosed in the transmission housing, are of the disk-in-oil type, toggle-locked. All bearings in the transmission are of the roller type. Steering is accomplished by means of the front wheels, assisted by the clutches for the individual tracks.

There is a track on each side, the length of each track developed being 164 in. and the width of the pads 8¼ in., while the length of the tracks assembled is 6 ft. Automatic lubrication is provided for the tracks. For ordinary service 10 x 1½ x 1½-in. traction lugs are recommended, while for use in deep sand or heavy mud 1½x2 or 1½x2½-in. lugs may be used.

The belt pulley, which is 12 in. in diameter by 8½ in. wide, and turns at 1100 r.p.m., is located on the left-hand side, the housing for the bearings extending through the track frame. When the tractor is used for haulage purposes the pulley remains idle. The engine is said to be capable of operating a 24 x 40-in. separator with all attachments. The governor is described as a turbine revolving in oil, which probably means that the pressure of the oil acts against a spring to determine the position of the throttle valve. It is claimed that the speed is maintained within 100 r.p.m. both ways of the standard.

The overall width of the machine is 48 in., the height 58 in. and the length 108 in. With fore-carriage the machine weighs 5000 lb. and without it 4500 lb. The machine can turn practically within its own radius. The front wheels are 26 in. in diameter and their tread is 56 in. They are fitted with anti-friction bearings, as are the steering knuckles. The drawbar swings and has vertical adjustment. The operator's seat is 32 in. wide and is provided with a cushion.

The Bryan steam tractor, which has been seen at a number of successive tractor shows, appears this year with a number of new components and modifications in design. According to the manufacturers, the boiler, which is of the same water tube type as formerly, is now tested under 1200 instead of under 2500 lb. per sq. in. hydrostatic pressure. The condenser, which is really a tractor type of radiator serving a somewhat different purpose, is now of G. & O. make. An automobile type front axle is fitted, with Timken roller bearings in the front wheels. The steering gear is the Wohlrab. All of the gears on the engine, jackshaft and the differential ring are of the heat-treated spur type. The differential is the Allen self-locking type.



Three types of Cletrac model F tractors with varying widths and ground clearance

As a whole the tractor is considerably smaller in appearance, the wheelbase having been shortened from 96 to 88 in., the front wheels reduced from 34 by 6½ to 32 by 5, and the rear wheels from 60 by 12 to 52 by 12. The fuel capacity has been decreased from 35 to 30 gal. and the water capacity increased from 40 to 60 gal.

The belt pulley size, which last year was indefinite, is now fixed at 18 in. diameter by 6⅝ in. width of face. This in conjunction with the governed engine speed gives a belt speed of 3000 instead of 2800 ft. p. m. The ground clearance is now 15 instead of 16 in.; the turning radius is given as 14 instead of 16 ft. and the speed ranges up to 5 instead of 6 m.p.h.

London Motor Plow is a new machine with three plows an integral part of the tractor. A Midwest engine is employed and the plows are raised and lowered by power.

The show was not representative enough to serve as a true indicator of tractor trends of designs, but the four-cylinder type of engine is gaining ground and the creeper type of tractor is increasing. The depression of the last year with sales nearly dormant is eliminating weak tractor makers and several old tractor manufacturers are really giving up tractor manufacture and will produce farm machinery only. During 1921 the sales of creeper tractors to states and counties for road building and contract work has proved big outlet for this type of machine.

Oil Specifications and Other Standards Work in Progress

THE Lubricants Division of the Standards Committee of the Society of Automotive Engineers is formulating definite specifications for lubricating oils for use in internal combustion engines with the exception of aircraft and Diesel engines. The specifications tentatively outlined follow in general the specifications of the American Society for Testing Materials and those given in the Bureau of Mines' Bulletin No. 5 in accordance with recommendations of the Interdepartmental Committee on Standardization of Petroleum Specifications.

At a recent meeting of the Division it was stated that compounded or blended oils are being used by a number of engine builders, due partly to their successful use in Europe, and that acidless tallow and castorated oils are used to some extent. Discussion as to what kinds of oils should be taken into consideration in formulating specifications led to the decision to confine the recommendations to straight mineral oils. It was thought that if specifications for blended oils are desirable, they can be developed after the Division shall have had an opportunity to obtain more information as to their use.

Tank Caps

The following comments in the matter of specifying the minimum size of the filler opening of automobile gasoline tanks have been referred to the members of the Parts and Fittings Division. The present S.A.E. Recommended Practice for Tank and Radiator Caps, page C58, S.A.E. HANDBOOK, does not specify the minimum size of opening, only the diameter of the threaded portion for both internally and externally threaded filler openings having been determined upon.

The demand to-day is for a gasoline pump that will deliver a given amount of gasoline in the shortest possible time. Pumps have therefore been designed for use in service stations with 1¼-in. hose and nozzles.

Complaints are received by pump manufacturers that the nozzles on these pumps are too large to fit into the openings provided in the gasoline tanks on many automobiles. This means that pump manufacturers are obliged to put on a small nozzle, thus restricting the discharge and defeating in a measure the advantages gained from a large pump. If an effort is made to force the delivery with the smaller nozzles, it requires more strength and the gasoline is delivered at considerably higher velocity.

Some automobiles are provided with large openings; 2½ in. is common. This matter should be taken up with the automobile builders as it is to their advantage to provide openings of proper size so that gasoline tanks can be filled quickly.

Sometimes the trouble is due to the connection to the tank being made by a pipe with an offset in it of small diameter. The smallest straight opening that should be used is 2 in. and where the connection is made to the side of the tank by a short pipe with an offset in it, it should be larger with the curve at a greater angle.

Oil Drain Plugs

At a recent meeting of the Engine Division the desirability of providing suitable means for easily draining all engine oil pans was discussed. It was decided that, as the oil drain is a part that is dependent upon individual engine design, no definite type should be standardized, but that a recommendation could be formulated which would indicate that an oil drain device should be provided, having a hole of a minimum size located at the lowest part of the oil pan or crankcase cover. In order that the Engine Division may base its recommendation on the best present-day practice, a questionnaire covering these points has been sent to engine builders and automobile producers who build their own engines.

Service Keynote of Chicago S. A. E. Meeting

Speakers urge engineers to get both the users' and the service man's point of view before designing new cars. Other interesting topics taken up at the meeting included building bodies for commercial cars. Speech of R. H. Grant was the outstanding feature of the annual dinner.

THE Society of Automotive Engineers held one of the most instructive sessions in its history on Monday of Chicago show week. The program was distinguished by the remarkable closeness with which it was adapted to immediate practical problems. The technical sessions were largely devoted to service. The two dinner speakers appealed for a return to bed-rock efficiency in business. After the banquet a great many declared that the speech by R. H. Grant on "How the Engineer Can Help Business at This Time" was one of the greatest that has ever been presented to the S. A. E.

The day's program on service included papers by B. M. Ikert of *Motor Age* on "Some Criticisms of Automotive Engineering by a Service Man," and "Commercial Body Supply and Service" by C. M. Manly and C. B. Veal. J. F. Page, service manager of the Packard company of Chicago spoke on the problems of the service salesman.

H. C. Buffington talked on the subject of special garage tools and automotive repair equipment.

Ikert's paper dealt with the ability of the designing engineer to save the car owner a great amount of money by looking ahead at the problems of maintenance with which the owner is confronted after the car is in service. This paper will be reprinted in full in a later issue of AUTOMOTIVE INDUSTRIES.

Mr. Ikert said in part: "One of the chief difficulties with many of our cars at the present time is that on a comparatively insignificant repair job it requires many hours of labor to remove and replace units before the job itself can be done and the car turned over to the owner. Under such conditions it is extremely difficult for a service station to establish a fixed price that seems commensurate with the nature of a job.

Time Element Important

"The time element in making repairs is important. Very often the parts to be installed cost a dollar or two, but the time required to install them is so great that the price for the work is out of proportion. In analyzing this situation one often finds that the car makers, by spending a few cents more per car, could so materially reduce the time element for service operations on their cars that automobile dealers and service men would not have to resort to all sorts of means in trying to keep customers satisfied with their cars.

"It is realized full well that to change existing constructions on some of our cars it would mean almost a complete retooling of the factory, new jigs, fixtures, dies, etc., therefore any criticisms which might be directed at engines or cars in the following paragraphs is done so with this in view. The major thought is to point out the things of which service station mechanics complain most frequently when they have to tear down or reassemble any of the units.

"We probably never shall have 100 per cent accessibility in our cars. A motor car is made up of just so many necessary units, and if we make one accessible it probably will have been done at the expense of accessibility to another. Also certain units may seem very accessible at the time of assembling the chassis in the factory, but when body and fenders are added the reverse is true. It is this condition with which the service station has to deal. I recently looked at an engine which, when in an engine-stand out of the car, was very accessible, but when in the car was hung so low and had so many accessories heaped around it, with a multitude of wires, control rods, carbureter hot air pipes, etc., to obstruct the movements of the mechanic, that all the efforts of the engine designer to get accessibility were nullified."

Mr. Ikert went on to tell of specific examples in design where parts had been made inaccessible in some 25 makes of American cars, when it would have been possible to make these same units just as good but easier to reach and, consequently, would have saved money on servicing.

Getting the User's Viewpoint

B. B. Bachman, president of the S. A. E., who was presiding at the meeting, opened the discussion on this paper by commenting on the fact that very often there was not the proper contact between the designer, builder, salesman, service man and car user. He stated that if all these branches could be brought together it would result in such an improvement in design that cars would be far better. The builder and designer are, of course, in close contact, but the service man is not so close, while the user is very often quite remote. It is quite apparent that Bachman has fully in mind the fact that the average engineer is not the average user.

The manufacturer has the opportunity to learn much from the user, Bachman added, if he will only analyze the information that comes to him through the sales and service departments. No machine is 100 per cent perfect in any department, and there are improvements that always can be made from any angle. The designers must take all of these angles into consideration and not permit undue influence of certain factors to destroy the all-around utility of his design. More intimate contact between the various phases of design, manufacture, sales, service and use would bring improvement.

Commenting on a question raised by Ikert regarding the proper aging of the cylinder block, Bachman declared this to be more a problem of production than of service.

A. H. Packer stated that he believed it would be possible to make more pieces universal. As an example, he cited the instance of a cam for the breaker box of an ignition device where by clever design the cam could be put on one way for a right-hand instrument and reversed for a left-hand. Since the manufacturer makes

cams for four, six and eight cylinders, by making the universal cam he need only make three types instead of six, and not only is money saved in manufacture but the service man need only carry three types of cam instead of six.

Packer also stated that it is a necessity for the designer to be open minded enough to accept and utilize the criticisms of the service man. He stated that there are many times when a part is theoretically correct, but when installed some practical difficulty comes up. As an example, he mentioned a certain generator which from the electrical standpoint proved to be highly efficient, but when mounted on a car received a stream of oil from the crankcase. The designer took a conceited view of the complaints, with a result that he did not go to the heart of the matter and eliminate the trouble and eventually some other concern got the generator business.

R. B. May urged all of the designers to utilize every possible means for getting information on this subject, so that designs will be made where the proper proportion of a repair charge will go to labor and to material. He suggested that a time study be made for each repair job which is likely to come up, this time study to be made at the factory where the design has been made and the dealers then instructed in the proper methods. It may be very well possible, he pointed out, for these time studies to result in alterations which will make the piece more accessible from the maintenance standpoint. This data will result in manuals to be passed out to the dealers by the manufacturers which will cover all of the essential service operations.

Some little discussion developed regarding the use of standard colors of wire for standard circuits, such as the horn, ignition, starting and lighting. It was pointed out that even if the purchasing agent could save "one-half cent per mile of wire," as one member put it, it might prove to be false economy in view of the fact that much more would be saved in avoiding the confusion which often exists on rewiring jobs.

H. M. Manley predicted that there will be more engineers in the operating end; in other words, the job of service engineer will be developed and his word will carry weight with the designer. Manley also cited efforts to standardize colors of wires and pipes on airplanes. These efforts ceased with the armistice. A. D. T. Libbey stated that the Automotive Electric Association has this matter of standard wire colors under consideration at the present time and will make recommendations to the S. A. E.

J. F. Page, service manager of the Packard company of Chicago, spoke on the problems of the man who faces the car owner when repairs are made. His talk was largely concerned with the neatness of appearance necessary on the part of the salesman and the ability to handle diplomatically the difficult questions which occasionally come up with the (sometimes) unreasonable car owner. Discussion was along this same line, one valuable point being the suggestion of one of the members that service managers bear in mind the three big essentials of having

(1) Trained personnel.
(2) Adequate equipment, space and tools.
(3) A good operating system.

B. B. Bachman closed the discussion by outlining the Autocar system of rebuilding.

Commercial Body Supply and Service

C. B. Veal read the paper on "Commercial Body Supply and Service," of which he is a co-author with C. N. Manley. In this paper there are specified the four general plans that have been followed by chassis builders in securing body equipment, as namely, the building of bodies in their own shop; buying on contract, the body maker adhering to plans and specifications of the chassis builder; buying from a local body maker to the order of the dealer or the owner, and the assembling from stock of standard sectional units recommended by the dealer or selected by the owner. The authors discuss each of these plans in detail.

With regard to the plan of using standardized sectional bodies, the different sizes of chassis used for commercial purposes are separated into four specified groups and the production of a complete standard line, including a number of styles of body for each chassis, is commented upon and illustrated, inclusive of detailed considerations of the all-metal body. The advantages to the dealer and to the user of the factors that are advocated in body building are enumerated, and the standardization of commercial cars and trucks is considered briefly. The authors say:

Four Building Plans

"The whole fabric of body service must be woven around the idea that a commercial motor vehicle has rendered its maximum of profit and usefulness only when the paying operations begin as soon as possible after it is assembled, and continues steadily at a maximum per diem for the longest time with the minimum losses through lay-ups for repairs and renewals. Any attempt to analyze the question of body service, therefore, must bring into consideration all phases of body design, production and distribution, as related to the chassis manufacturer, the dealer and the owner, as well as the body manufacturer or builder.

"Four distinct general plans have been followed by chassis builders in securing body equipment:

(1) Building in their own shop.
(2) Building on contract by body maker to plans and specifications of chassis builder.
(3) Building by local body maker to order of dealer or owner.
(4) Assembling from stock standard sectional units recommended by dealer or selected by owner.

"All four are available to a greater or less extent at present, and to determine the effect of each upon the ultimate question of service we will examine each plan as related to the interests of the chassis builder, the dealer and owner."

Analyzing the first plan, that of building in their own shop, the authors state that the effort expended in trying to build up a permanent business of selling the chassis and body as a unit is, with few exceptions, certain to be entirely out of proportion to the results attained. This is largely due to the need for such a wide variety of bodies except in certain lines where it is possible to get on a large production basis.

The second plan, while it necessitates the chassis builder carrying a body-designing and engineering department, relieves him of the greater investment in shop and tool equipment and body fabricating organization. The body builder, through his ability to furnish other designs of his own for the trade and to take on contracts to supply various chassis producers, is in a much better position than the latter to acquire an adequate volume of body business for efficient and economical production. Here the advantage to all concerned, as compared with the first plan, ceases, however, since the distribution troubles remain the same, with the possible addition of an initial freight shipment of bodies from the body builder to the chassis plant, and the complications arising in repair service with the attendant em-

barrassment to the ultimate user through the interdependence of the chassis producer and the body builder in all matters of responsibility affecting the guarantee, proper functioning and durability of the body. Of the four methods applicable to the supply of bodies for commercial vehicles and trucks having national distribution under existing conditions undoubtedly this plan has the most to recommend it.

The third plan, custom-built bodies, historically has been the accepted method of most motor-vehicle builders upon first entering the commercial-car field and is still the plan generally followed by the majority of truck companies. This practice came into effect not through the application of any special economic theory but rather through the natural working out of conditions as they were and still are to a lamentable degree, especially in connection with heavy-duty trucks.

The successful operation of the fourth plan has been made possible only comparatively recently, owing to a lack of sufficient demand and the continuous evolutionary changes in body requirements as the business developed. Through the adoption of this plan the chassis builder and the dealer derive a great many benefits. Not the least of these for the former is complete relief from the undertaking of body-building. While eliminating the capital investment involved in the first plan, he simultaneously removes from his dealers the burden of body inventories common to the first and second plans. Moreover, he is assured that his chassis will not be abused by being made to carry a poorly proportioned or ill-fitting body of excessive weight or capacity. The dealer is further helped by overcoming the showing up of merchandising while waiting for each body to be built individually under the third plan.

By building the bodies in sections and standardizing these sections it has been found possible to use certain sections for very many different types of these bodies. In some respects the scheme parallels, although in a very different field and with much greater economic possibilities, the flexibility and utility of the sectional bookcase. Standardization has been carried to such an extent that the reduction in the total number of component parts has diminished noticeably the body-builder's investment in raw materials, work in process and finished goods.

Many major parts of bodies and cabs are interchangeable on various types of body. Starting with one platform or base, a choice can be made from several side panels, rear sections and tops, thus making it possible to assemble any one of a dozen body styles on this one design of base. Likewise, doors and windshields used on cabs or vestibules can be assembled interchangeably with a variety of other body units. In fact, windshield, vestibule doors, vestibule side windows, rear doors, toeboards, cushion and lazy-back are worked out readily, each in a single-unit design common to all bodies of whatever model where any one of these items is required. A single end gate can be used to equip several models.

Referring to articles published in AUTOMOTIVE INDUSTRIES on this subject, President Bachman called on J. E. Schipper to open the discussion. Mr. Schipper referred to investigations he had made in connection with these articles which disclosed the facts that body manufacturers are very anxious to see standards in certain chassis dimensions which affect the attachment of bodies, particularly the distance between frame side rails and the distance from the rear end of the cab to the rear end of the chassis frame.

C. M. Manley emphasized this discussion and pointed out the real need for standardization, particularly as it affects foreign trade. Other members brought forward evidence to the effect that considerable money would be saved if standardization were effected in the cab as well as in the dimensions of the chassis which affect body attachments. George S. Cawthorne stated that the standardized cab is just about here and that it will be of great commercial utility from an economic standpoint.

Dinner

The annual Chicago dinner of the society was held at the Drake Hotel and was attended by 350 members and guests. President B. B. Bachman presided, with H. L. Horning as toastmaster. The feature of the evening was a brilliant speech by R. H. Grant, general manager of the Delco Light Company, on the subject of how the engineer can help business at this time. Professor Moulton, economist of the University of Chicago and a noted authority on foreign affairs, spoke on the business situation in relation to the automotive industry.

B. B. Bachman opened the speeches by continuing the picture of the technical session of the afternoon, in which service was the keynote. He spoke of the duty of the engineer to further this idea of so designing his product that it rendered the maximum service at the least expense to the consumer. H. L. Horning, in his inimitable combination of seriousness and humor, pictured our present business situation and struck a note of optimism in his introduction of R. H. Grant.

Mr. Grant delivered what members present say was the most powerful and yet practical speech that the society has ever had presented to it. He made a plea for teamwork in all branches of business and the abandonment of the prima donna attitude on the part of department heads. He pleaded for more anxiety on the part of the manager or engineer to make a better showing on the profit and loss sheet for the entire business, rather than economy in the particular department, which might not mean anywhere near the same economy for the entire business.

He asked that we stop moving machinery, employing armies of sweepers and watchmen and other products of war time and get back to the ground floor in business. His speech will be printed in the near future. The picture he painted was completed by the speech of Professor Moulton, who showed how the situation in this country was related to that of Europe.

Automobile League Is Organized in Madeira

ORGANIZATION of an automobile league in Funchal, Madeira, for the purpose of increasing tourist traffic on the island and thus secure additional revenue for the government and merchants, was announced recently in a report from United States Consul S. E. Wells. The chief objects of the league are to promote legislation for the widening of streets, construction of new highways and better port facilities.

The majority of streets in Funchal are narrow and there are not more than twenty miles of roads that are suitable for motor traffic. More are in process of construction, however. There are in Madeira slightly less than 100 motor-driven vehicles, of which about twenty-six are trucks of 2 tons or less. The law prohibits operation of trucks of more than 2 tons' capacity unless they are equipped with pneumatic tires.

A Modern Electric Passenger Vehicle

New product of Rauch & Lang resembles the gasoline closed car in external appearance and has many similar mechanical features, but retains the desirable characteristics of the electric. Construction details which result in economical use of power are worthy of consideration in gas car design.

By Herbert Chase

AN electric passenger car which in many ways resembles the modern type of closed gasoline car is being produced by Rauch & Lang, Inc., a company formed some two years ago to carry forward the electric vehicle business of the Baker R. & L. Co. The concern is now manufacturing chassis in its new plant in Chicopee Falls, but the bodies used on this chassis are still made by the Baker R. & L. Co. in its Cleveland plant. The chassis, which is shown in one of the accompanying cuts, has a wheelbase of 102 in. and is of fairly light construction for a car weighing, complete with body and battery, approximately 4000 pounds. The mileage which an electric vehicle will make on one charge of the battery depends, to a considerable extent, upon the weight of the vehicle; hence, all parts are made as light as possible, consistent with good practice, proper strength and a good length of life. It is necessary also to make vehicles of this character easy running, since the propulsive ability is limited to that of the battery and an electric motor of relatively small power as compared to the average gasoline car.

In the car under discussion the battery alone weighs approximately 830 lb. There are a total of 42 cells, 22 of which are carried in the front compartment and 20 in the rear. The battery used in this case is either the special thin Exide M.V. 13 plate or the Philadelphia W.T.X.I. 15 plate, both of which have a rating of about 180 ampere-hours. These batteries are said to have a life of from 2 to 4 years, depending upon the care they receive and the amount of use.

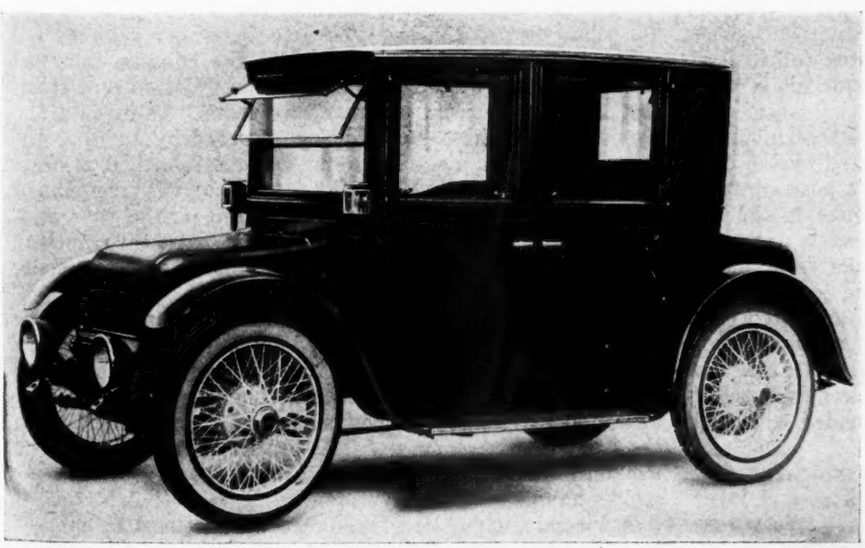
The frame is pressed from 5/32-in. carbon steel and has seven cross members, most of which are required to afford proper support for the battery. The front springs are 40 in. long by 2 in. wide and the rear springs 57 by 2¼ in., both being of the semi-elliptic type. The rear springs are underslung. The spring shackle bolts are of ¾-in. diameter and are drilled out to save weight. The wheels are equipped with 32 x 4½-in. tires all around.

It will be noted that the motor is mounted slightly aft of amidship position and has its axis inclined upward toward the rear to facilitate the drive through the double universal joint shaft to the overhead worm on the rear axle.

The motor is a straight four-pole series type, so far as the first five speeds are concerned, but it has a shunt field which opposes the series field on the sixth or highest speed position of the controllers. The motor is geared 8.6 to 1 on the worm, and is capable of driving the vehicle at a maximum speed of about 28 m.p.h. on level road, in the sixth controller position, and 25 m.p.h. in the fifth.

All the cells of the battery are connected in series, and a resistance is used in the armature circuit in first, second and third speeds. In fourth speed, the battery is coupled direct without resistance. In fifth speed, a resistance is shunted across the field to weaken it, and, in sixth speed, the shunt field opposes the series field. The various controller positions are shown in the accompanying diagram.

The motor has a rating of 2.5 to 3.5 hp., but is capable of withstanding very heavy overloads. The armature shaft is mounted on ball bearings, and carries, at its forward end, a brake drum against which two external shoes, pivoted on the motor frame, bear when the brakes are applied. The motor, formerly built by the Baker R. & L. Co., is now being produced in the Rauch & Lang plant, together with nearly all other parts of the chassis.

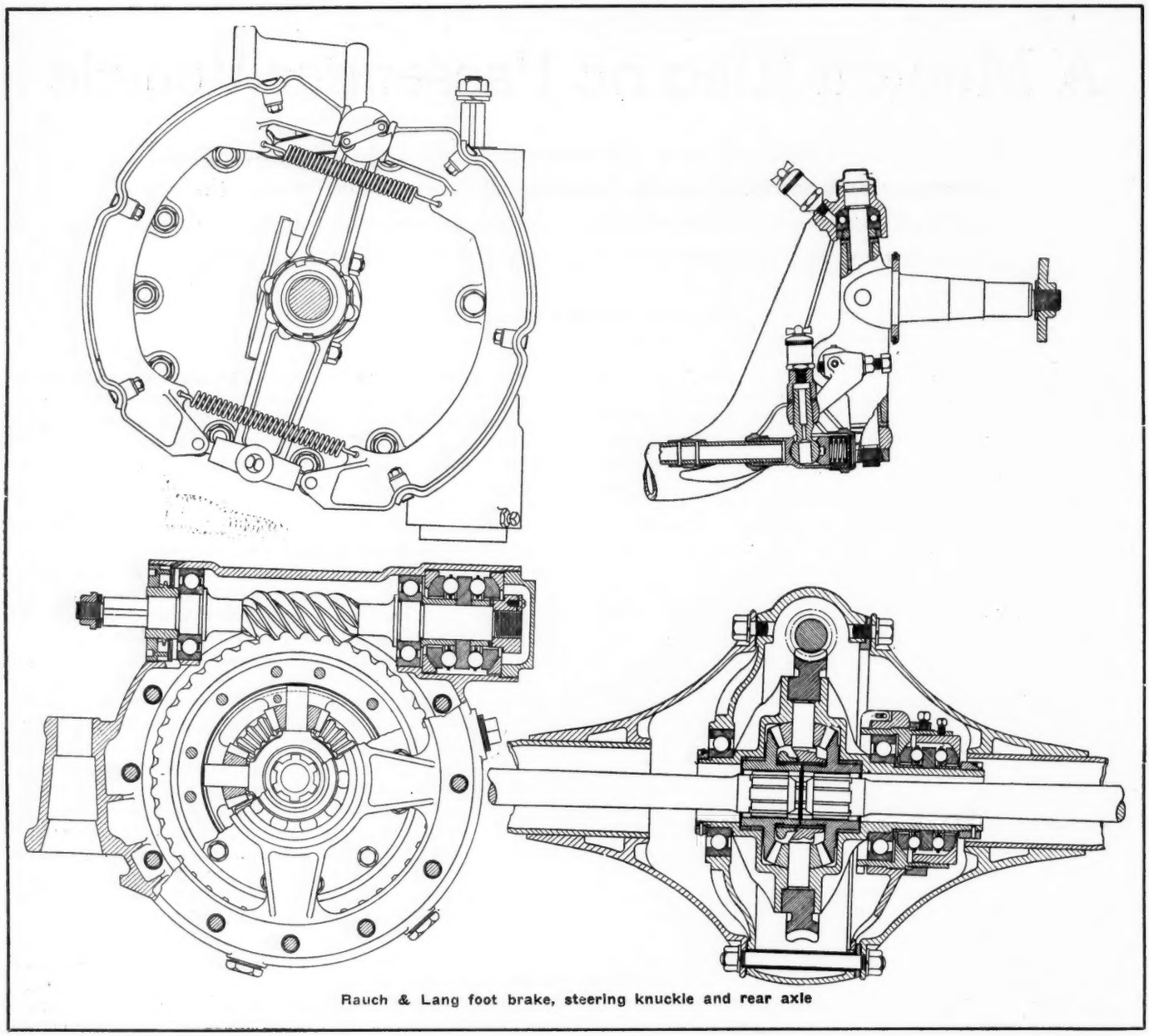


Rauch & Lang Model S66 sedan

The power is conveyed to the worm through a propeller shaft with universal joints of Rauch & Lang construction at either end.

The drive is through the forward half of the rear springs, but torque is taken by a torque arm anchored to the rear end of the motor and pivoted on the rear axle housing.

The rear axle, which is built complete in the Rauch & Lang plant, is of the ⅞-floating type, and employs a straight type overhead worm mounted in radial and thrust ball bearings. Timken bearings are used on all wheels. The central housing of the axle is of cast steel and the tubular members or pressed in and riveted with nickel steel rivets. The tubes are swedged to give adequate strength with lightness. The foot brakes are of the internal expanding type and bear on pressed steel drums of



Rauch & Lang foot brake, steering knuckle and rear axle

18-in. diameter mounted on the rear wheels. The shoes are 2½ in. wide and are lined with asbestos fabric held in place by six T-bolts on each shoe. Castor oil is used for lubrication of the worm.

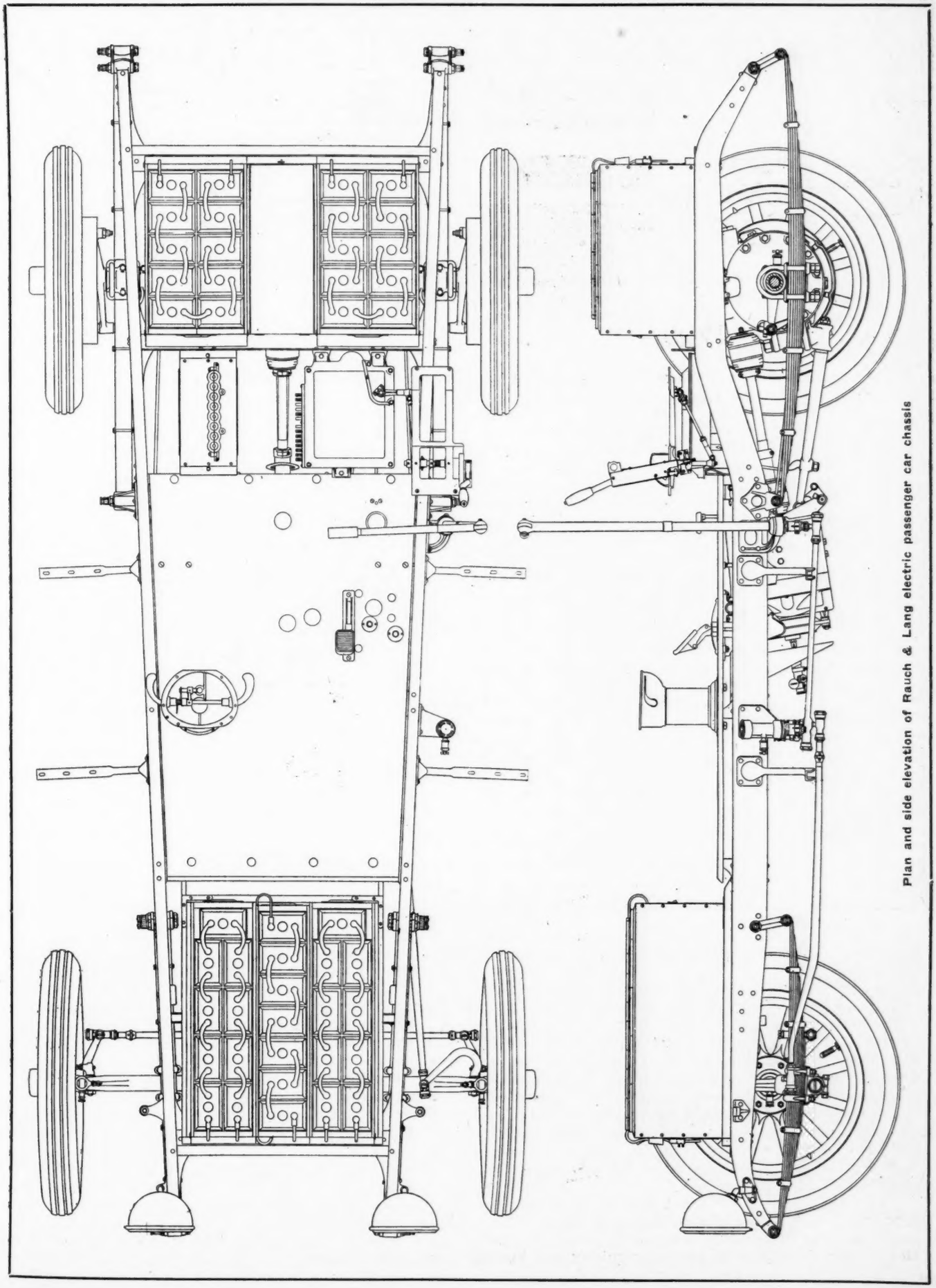
The hand or so-called emergency brake is that mounted on the front end of the motor. It is operated by the controller handle when the latter is drawn into a position back of neutral. At the same time the hand brake is applied, the electric braking effect on the armature exerts a retarding influence. The lining of the hand brake is of metal composition and bears on a steel drum. The foot brake is provided with a ratchet lock, and this is so arranged that the electric horn blows a warning signal if an attempt is made to start the vehicle with the brakes on.

The front axle is of tubular section, but is otherwise of more or less conventional design. It is provided with ball thrust bearings on the steering pivots.

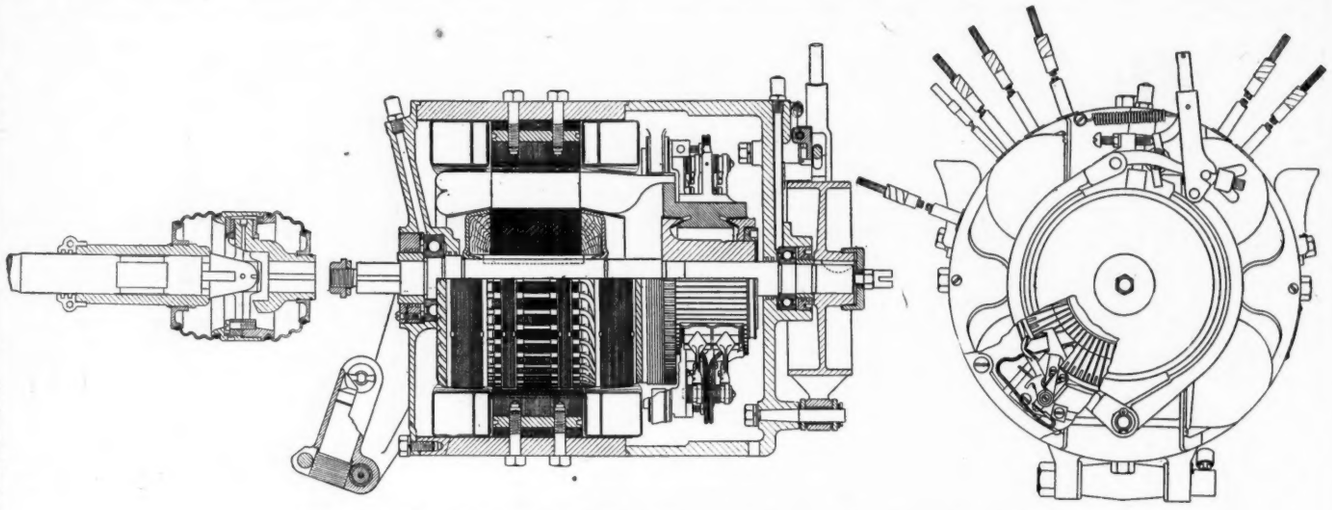
Steering is accomplished by a lever arm which turns a vertical column carrying at its lower end a second lever connected direct to the drag link which is connected in turn to the steering knuckle. This is not an irreversible type of steering gear, but has been used with satisfaction for years on practically all electric passenger vehicles. It will be noted, from the drawing of the chassis, that two positions of the steering column are provided so that steering can be done from either of two seats. There is a disconnecting mechanism which is operated by turning the front seat. When the latter is facing forward, it is occupied by the driver and steering is done by the occupant of this seat, but when the driver is riding on the rear seat, the forward seat is turned toward the rear, thus putting the rear control mechanism into operation and rendering the forward one inoperative.

The controller employed is of the fan type and uses two movable fingers. It is operated by a handle beside the driver's seat. Two such handles are provided and made separately operative. In the controller handle there is a switch lock arranged to open the main battery circuit when the vehicle is not in use. A button for operating the Klaxon horn is fitted conveniently into the end of the controller handle.

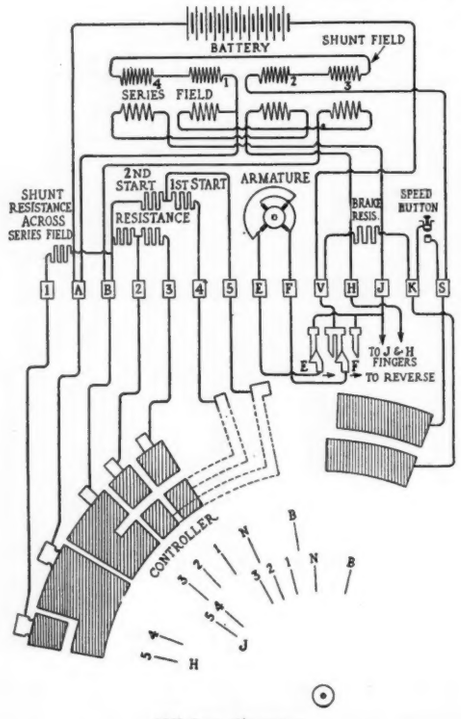
A special composition resistance wire is used in connection with the control of the motor. It is wound on porcelain insulating supports and placed in a ventilated sheet



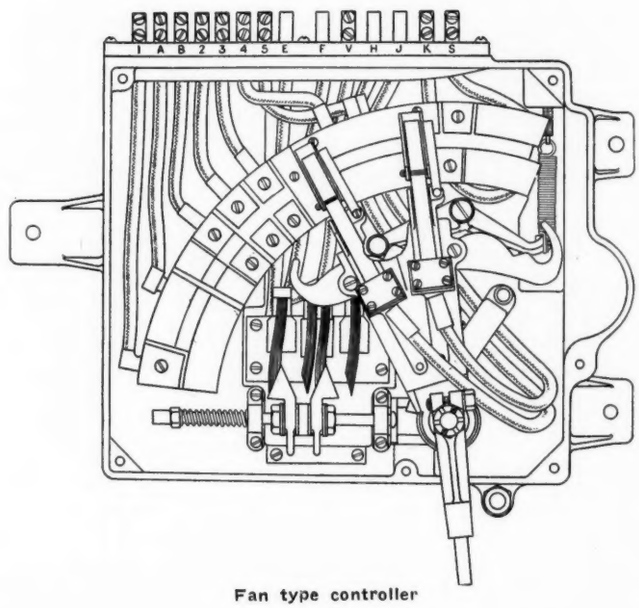
Plan and side elevation of Rauch & Lang electric passenger car chassis



Universal joint and motor showing emergency brake mounted on motor shaft



Wiring diagram



Fan type controller

metal casing, mounted on the chassis frame adjacent to the controller.

The speedometer is driven off the front end of the motor through a worm and wheel, giving reduction of about 5 to 1.

The instruments regularly fitted include a Sangamo ampere-hour meter, Weston ammeter and voltmeter, Waltham speedometer and clock. Other equipment includes Goodyear q.d. rim for straightside tires, headlamps and pillar lamps. Two body models are provided; a coach seating five persons and arranged for driving from the rear seat only, and a four-door coupé-sedan seating five and with provision for driving from the front. These new models are added to that known as the C55 double-drive coach, which is continued.

The Rauch & Lang electric possesses the advantages common to most other electric vehicles, in that it is practically noiseless in operation, is simple to operate and flexible. It has the ability to get away quickly and handles easily in traffic. It can also be turned around readily in restricted places because of its short-turning radius.

IN concluding a paper on "Cracks in Aluminum Alloy Castings," R. J. Anderson of Pittsburgh, Pa., says that the melting temperatures should be low; overheating in the furnace should be avoided. Open-flame furnaces should be run with a non-oxidizing atmosphere in order to avoid the formation of much aluminum oxide and consequently occluded dross in the alloy. Skimming should be adequately and carefully done and the melting practice should be conducted as cleanly as possible. Foundry floor sweepings should not be charged into the furnaces unless sieved, and foreign materials should be kept out of the furnace charges. The pouring temperatures should be as low as is consistent with filling the mold readily with metal; high pouring temperatures should be avoided.

Peugeot To Produce Automotive Injection Engine

New product is said to be capable of using any liquid fuel. It operates on two-stroke cycle, has two working and one scavenging pump cylinders, develops 50 hp. at 1250 r.p.m., weighs 550 lbs. and is reported to use 0.397 lbs. of fuel per hp. hr. at full load and 0.484 lbs. at quarter load.

By W. F. Bradley

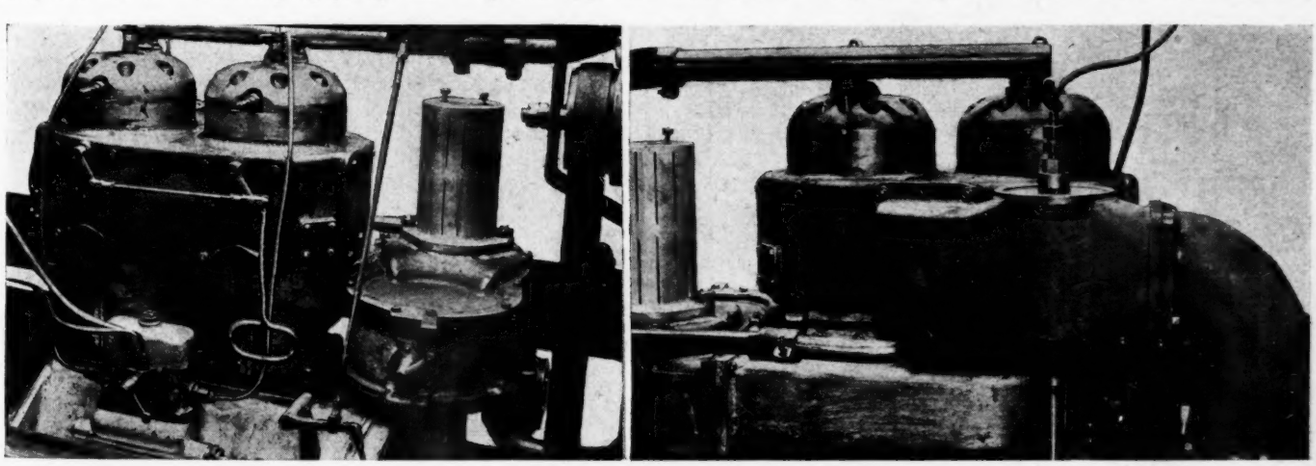
PEUGEOT has decided to go into production on a two-cylinder two-stroke direct injection engine to be used on trucks and passenger cars. The engine, which is built under Tartrais patents, weighs exactly 11 pounds per horsepower, has approximately the same overall dimensions as a normal type four-stroke power plant, consumes 0.397 lb. of fuel per horsepower-hour under full load and less than 0.484 lb. under quarter load, and will run on practically every kind of liquid fuel. After being regulated to run on kerosene, the engine was successively switched over to various types of coal tar and crude oils; it was also run on such vegetable oils as palm, castor, cotton and coco, and also on cod liver oil.

The first series of engines built are twin-cylinder vertical type of 120 by 150 mm. (4.7 by 5.9 in.). This engine, which develops 50 hp. at 1250 revolutions, weighs 550 lb. complete, and was designed with a view to its use either in truck or semi-stationary work. One of the engines was fitted in place of a four-cylinder Schneider on a Paris omnibus chassis and used on the road. With the normal accelerator control only this omnibus possessed a wider range of flexibility than with the engine regularly employed. An engine of this type has a big field of application for stationary or semi-stationary work, but Peugeot intends to use it also for automobile service and will put on the market a series of passenger cars with a 25-hp. twin-cylinder engine for Colonial service.

Among the distinctive features of the Peugeot engine are direct injection of the fuel into the combustion chamber; the use of a scavenging pump and a special type of cylinder head designed to set up turbulence. The most important of the various patents held by the inventor deal with the type of combustion chamber and the provision for securing turbulence of the mixture prior to its explosion.

A normal type aluminum crankcase receives a three-bearing crankshaft with throws at 180 deg., having no other peculiarity than the provision made for driving the air pump off one extremity. The oil pump and the water pump are of normal type. To the shaft of the latter is connected an electric generator which is required only for starting and if desired dry cells or a storage battery can be used instead.

The cast-iron cylinders have annular ports uncovered by the piston at the end of its stroke. The upper ring of ports is for the exhaust, and the lower ring for the intake. A cylinder, with jackets removed, revealing the two rings of ports, is shown in Fig. 1. The cylinder consists of a cast iron barrel in which the piston operates and a special head, of an alloy of chrome and nickel, in which the explosion takes place. The cylinder barrel communicates with the head by a narrow cylindrical passage, the diameter of which is only slightly larger than that of a deflector mounted on the piston head. Fig. 2 shows the cylinder head and the deflector, dismounted from the piston. The cylinder walls are water jacketed but the head is not; instead, it is inclosed by a bronze cover, or external head, bolted to the cylinder barrel, having air pockets which tend to maintain the combustion chamber at the highest temperature which can be employed with the metal used. In Fig. 3 the combustion chamber is shown in place inside the bronze housing,

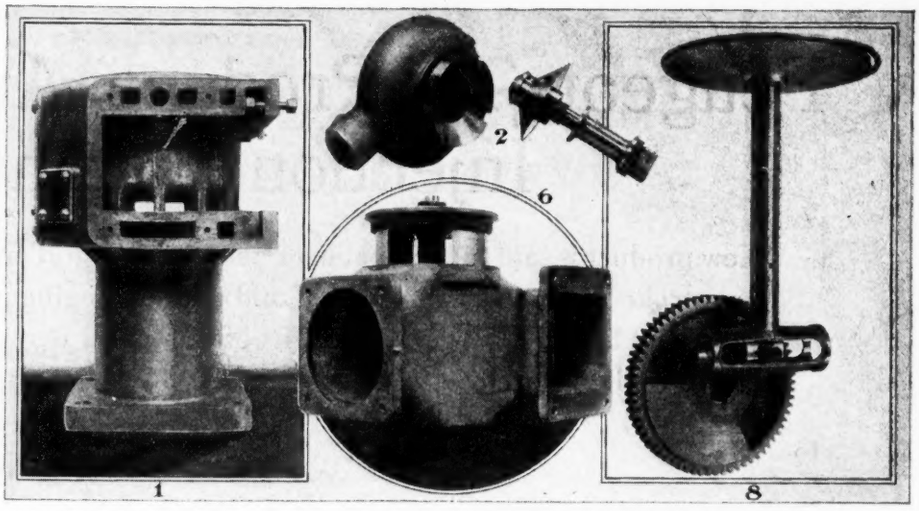


The Peugeot-Tartrais two-stroke fuel injection truck engine showing location of fuel and scavenging pumps, manifolds, etc.

which forms the outer wall of the air jacket. In the center of the combustion chamber is a pulverizer shown in Fig. 4 by means of which fuel is injected into the cylinder at the correct moment.

The piston has an aluminum alloy head and cast iron skirt, the deflector being fastened to the former. The cast iron skirt is employed to overcome expansion difficulties sometimes encountered with all-aluminum alloy pistons. Instead of cast iron rings the piston is fitted with a number of steel compression rings.

At the end of the stroke the deflector on the piston head passes into the mouth of the combustion chamber, driving the compressed air into the chamber at high velocity, and setting up a considerable degree of turbulence. The motion of the air causes the fuel ejected from the pulverizer in a fine spray to be brought into violent contact with the heated walls of the combustion chamber. The deflector in the piston head is cupped and provided with holes, the object of which is to aid pulverization.



Parts of the Peugeot-Tartrais engine. Fig. 1—Working cylinder with jackets removed, showing inlet and exhaust ports. Fig. 2—The inner cylinder head or combustion chamber and the deflector which is attached to the piston head. Fig. 6—Throttle valve used in exhaust manifold. Fig. 8—Piston and Scotch yoke used in scavenging pump

As shown in the drawings, Figs. 3 and 5, an ignition plug is mounted horizontally in the cylinder head. This is required only when starting from cold and is used only for a few moments. By using this device the engine can be started up from cold with the same rapidity and the same degree of assurance as any ordinary gasoline engine. By means of a 4-volt current, which can be obtained from storage batteries or a generator, the central electrode is brought up to a temperature sufficient to ignite the mixture. Within a few minutes the cylinder head attains a sufficiently high temperature to cause self-ignition of the mixture formed in the combustion chamber. Since the plug remains permanently in position it has been necessary to find an insulating material capable of standing up under high temperature and high pressure. The material used is a high-grade steatite known as "Isolantite."

At the end of the power stroke the exhaust gases pass out through the upper ring of ports. Air compressed to about 3 lb. per sq. in. is admitted direct from the scavening air compressor into the cylinder via the lower ring of ports, without the use of any reserve air tank. The pump is a double-acting, while the distributor which controls the flow of air into the working cylinders is of the barrel type. The compressed air entering the cylinder radially, strikes the central deflector, passes upward into the combustion chamber and then descends, driving the exhaust gases before it. By reason of their inertia there is a danger of the exhaust gases carrying along with them a certain quantity of pure air, thus forming a partial vacuum in the cylinder. To prevent this experience has shown that it is necessary to create a back pressure in the exhaust pipe. This result is obtained by a mechanically operated throttle loosely fitted in the exhaust manifold. This appliance is shown in Fig. 6, the throttle being partially raised out of the manifold.

One of the most difficult problems in connection with this engine has been in securing correct material for the

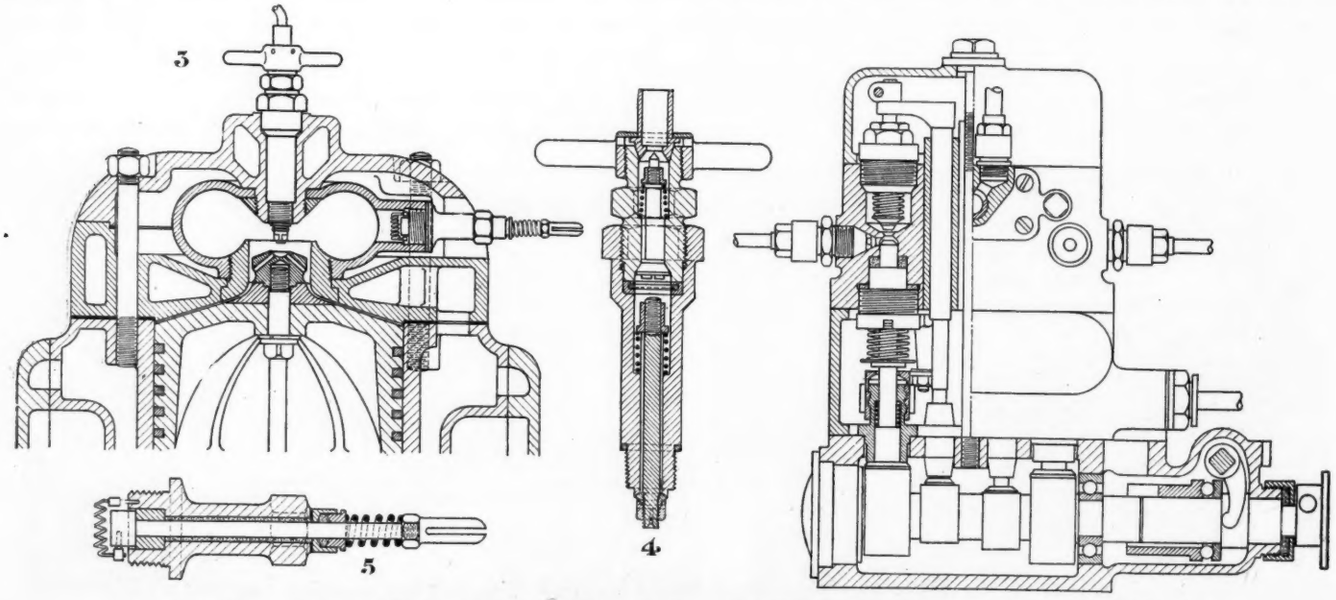
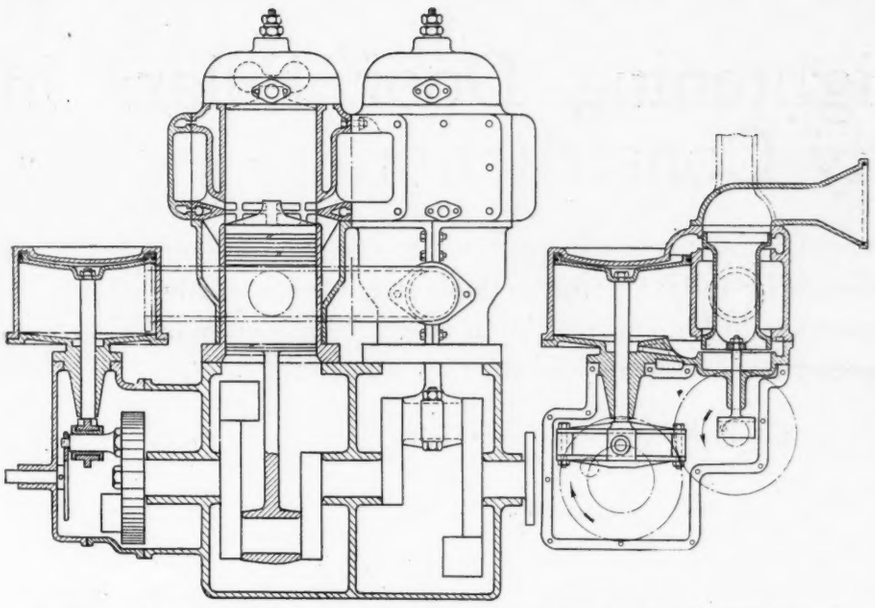


Fig. 3—Sectional view of cylinder head and piston, showing air-jacketed combustion chamber, and location of deflector, igniter and injector. Fig. 4—Section through injection valve. Fig. 5—Section through igniter. Fig. 7—Part sectional view of fuel pump



Diagrammatic views of the Tartrais fuel injection engine showing sections through scavenging pump and working cylinders

combustion chamber and in mounting it on the cylinder barrel so that it would operate satisfactorily. The head has to be maintained at the highest possible temperature, while the barrel must be adequately cooled to avoid lubrication difficulties. The method of assembly is shown in the sectional drawing through the piston and the cylinder head (Fig. 3), from which it will be seen that the combustion chamber is free to expand and contract without affecting the gas tightness of the two joints between the head and the cylinder barrel and between the head and the fuel injector. This feature of the design, which is covered by patents, involved several years of experimental work.

The fuel pump is shown in part section in Fig. 7. When used on trucks two fuels are provided for; kerosene for starting up, and heavier oil for normal running. This explains the presence of two feed pipe connections on the upper portion of the pump housing. There is a separate outlet to the two cylinders of the engine to left and right of the pump housing, for this latter really comprises two distinct pumps in one unit. Variations in the amount of fuel fed to the engine are obtained by altering the stroke of the fuel pumps, this alteration being obtained by pedal control when the engine is used on a truck chassis.

Although this engine has passed out of the experimental stage, as is shown by the fact that Peugeot has put a series of 50-hp. models into production, experiments are being continued. Among these are a series of power and fuel consumption tests with every known kind of liquid fuel.

The most immediate application of an engine of this type is believed to be in Colonial regions where gasoline is costly or unobtainable, but where other liquid fuel is plentiful. It is believed that these tests will show the possibility of using this engine with whatever local fuel happens to be available.

A New Steering Gear for Passenger Cars

THE Ross Gear & Tool Co., which for 15 years has been making steering gears for the motor truck industry, has entered the passenger car field with a steering gear suitable for this type of vehicle. The new gear embodies the same mechanical principles of design as the heavy-duty truck steering gear—namely, a solid nut operated by the steering wheel through the steering tube. In the heavy truck gears the screw turns with the steering nut, and the nut, traveling up or down on the screw, turns the trunnion shaft and swings the steering arm. In the new passenger car gear this operation is reversed, although the principle is the same. The nut rotates with the wheel and the screw moves up or down inside the nut when the nut is rotated. The movement of the screw turns the trunnion shaft and swings the steering arm.

In the new design the connection between the steering tube and the nut is a mechanical four-jaw connection, there being no brazing in this steering gear. The nut, which is made of gray iron, is supported both above and below by ball thrust bearings. Gray iron is used for the nut, because it is always in compression. The nut is a solid piece and gray iron presents the best bearing surface to the screw, which is of case-hardened steel. The threads of the screw are ground. As the nut rotates, the screw travels up and down in the housing and is prevented from rotating by suitable means provided inside the housing.

On the lower end of the screw two swivels are carried, one on either side. The trunnion shaft has two projecting arms, in which cylindrical openings are provided. The swivels on the lower end of the screw operate in the openings of the trunnion shaft, so that as the screw is moved longitudinally by means of the nut, the swivels move longitudinally and rotate the trunnion shaft. The cylindrical openings in the trunnion shaft completely envelope the swivels. The trunnion shaft is hardened and all of the operating surfaces are ground.

Parts of Ross steering gear for passenger cars

The steering arm is secured to the trunnion shaft by means of tapered splines. The gear has been so designed as to use heavy oil, rather than grease, and it is so made as to retain the oil indefinitely under various conditions of service.

The gear is designed for easy operation. It has a compromise degree of irreversibility so that little bumps in the road are not transmitted to the driver's hands, but the car will follow the course for which it is set. This is claimed to be valuable in traveling on dirt roads or on fresh gravel or broken stone.

Means for Lightening Door Pillars in Body Construction

Saving could be accomplished by a reduction of the material used in door pillars. Gain accomplished by following the methods suggested would be slight but the appearance would be considerably lighter. Elimination of unnecessary material a step toward cheaper production of enclosed bodies.

By George J. Mercer

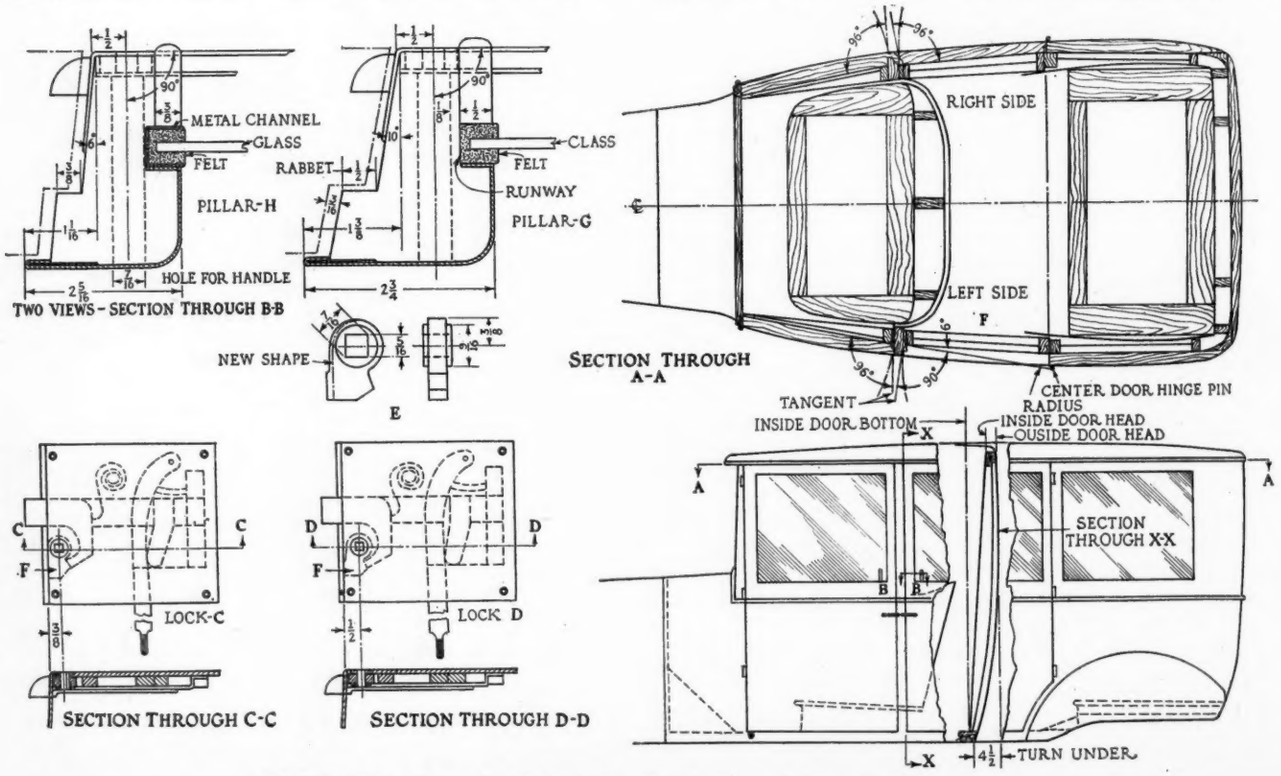
WEIGHT is an important consideration in body construction, yet little has been done toward making that important part of a car materially lighter. This has been largely due to the fact that present practice in wood framing and metal panels does not permit the body builder to leave out any of the members used, or make them much lighter without incurring a risk of shortening the life of the body.

There is one place, however, where a saving in size can be accomplished, namely, in the door pillars. Even the gain accomplished there would be slight, but the effect in giving the appearance of lighter weight would be considerable.

The accompanying illustrations show the side elevation of a sedan body and sectional views of the points emphasized. The two sectional views through B-B show how the saving in size is accomplished. Pillar G is 2¾ in. wide and pillar H is 2 5/16 in. or a saving of 7/16 in. If the body has four doors there will be an additional glass space of ⅞ in. on each side due to the change in dimensions of the lock pillar alone. When the lock pillar is lightened it is always possible to make some reduction on the hinge pillar.

It will be seen that the saving has been made by straightening the pillar face, decreasing the bevel from ½ to ⅜ in., and saving in the space allotted for the glass runway.

In considering the door bevel it should be remembered that some draftsmen are lax in shading the bevel on the door and simply make it to suit the bevel on the lock without further investigation, other than to make sure that the bevel is great enough for easy clearance. The manner in which the minimum permissible bevel is determined is shown at F on Section A-A. In order to make certain that the inner bottom corner of the door will clear in opening the following must be considered. The less turnunder to the door, the less bevel will be required for this purpose. The bevel is determined by drawing a tangent to the circle described by that inside point on the door which is furthest from the hinge axis. The



Side elevation of a sedan body and sectional views of door pillars, locks, etc.

section through X-X gives the turnunder and the inside point of the door bottom is used in determining the correct bevel in this case.

Having determined the bevel and selected a commercial lock that is suitable, the sectional view of pillar H can be drawn. To realize the gain to be made from this correct selection of bevel it is only necessary to compare pillar H with pillar G. On the latter a 10-deg. bevel is used and the result is that the dimension from the inside corner of the pillar to the extreme of the moulding is 1⅜ in. compared to 1 1/16 in. on pillar H at the same place. This is a difference of 5/16 in. less ⅛ in., or an actual gain of 3/16 in. Many times the added thickness is needless as it serves no other purpose than to give the body a heavy appearance.

While the subject is being discussed it might be well to consider the desirability of selecting locks which have the handle hole as near to the face plate as possible. It was customary in carriage days to fasten the handle on the inside with a covered nut and finish washer. These were put on over the trimming and the size of the washer necessitated the hole being placed back from the face in order that the washer would not project over the edge. To-day it is customary to blind fasten the handle and since the screw and washer are small the hole can be close to the front. This can also be used to effect a saving in pillar size. The two views, one lock D and the other lock C, show how it is possible to save ⅛ in. by simply having the tumbler shaped, as shown at E. Lock makers are giving both these points attention on new models, and no doubt would have made earlier changes if body builders had been less lax in their attention to these points.

The second way in which gain in pillar size has been accomplished has been by lessening the size of the door rabbet. On carriages ⅜ in. was used for the rabbet. There is no actual need of more, except when commercial articles are used, which have not been considered in connection with making bodies look light.

The third point of gain has been the runway. There are different methods of providing for the sliding of the glass in the door pillar runways. Sometimes a metal channel, covered with velvet is used, or the channel may be fastened to the glass and then covered. In the latter case the frame works in a wood groove. Another method, as shown on pillar G, is sometimes used. In either case the depth of the runway in the pillar is 7/16 or ½ in. as against the ⅜-in. depth used on carriages. The bottom of the runway, of course, must not interfere with the hole for the lock handles. The shank of this handle is 5/16 in. square, therefore a 7/16-in. hole is the minimum that can be used through the pillar to enable the handle to turn. As a matter of safety ⅛ in. has been allowed between the hole and the bottom of the runway at their crossing.

Going back to the drawing of the locks it will be seen that the handle hole should be toward the front as much as possible. The ⅛ in. gained on lock C over lock D would just furnish the necessary clearance for the runway.

On pillar H the runway is cut up to the line allowed for the handle hole. In order to do this felt is used in a metal channel. By the use of felt the channel will prevent water entering the pillar through the runway. In case the pillar, in process of working up, should give trouble by reason of the hole actually cutting into the runway, about ⅛-in. leeway can be secured by cutting away the back face of the channel and part of the felt.

As mentioned at the outset the gain outlined is not large, but manufacturers are facing the problem of making enclosed bodies for less money than formerly. In bringing out new models all the changes possible that will make them lighter in appearance will prove a distinct advantage. They give also a tangible argument for sales stimulation.

Locks, hinges and window regulators are receiving marked attention by both the manufacturers of these parts and the buyers. The proper working of the doors is an important factor in car selling. For the same reason the correct hinging of the doors on enclosed bodies is important. As shown in the illustration, the front door is hinged at the front and the rear door aft. For safety both doors should be hinged at the front, as this would prevent the door being broken off by hitting an obstruction should it swing open while the car is in motion. The user, however, usually wants the rear door hinged at the back for convenience in entering and leaving the car.

Indiana's Road Maintenance Expenditures Beat Record

INDIANA spent $8,166,121.94 on its roads during the fiscal year ending Sept. 30, according to the annual financial report prepared by John D. Williams, chief clerk of the Indiana Highway Commission, of which Lawrence Lyons is director. The amount spent on the construction of new roads was $3,439,926.12 and on maintenance $4,377,243.84. Other disbursements for the year were, administration, $30,925.64; motor transport, $184,297.54; capital expenditures, $130,655.21; right-of-way, $2,573.59, and liability damages, $500. The total cost of all supervision of all work done by the highway department was $234,855.20, or 2.87 per cent for the total expenditures, or 3.16 per cent of the construction and maintenance costs, a better record than has ever been made by the state before this time.

At the end of the fiscal year of 1920 the commission had a balance of $2,784,605.11. From all other sources the department received this year $6,715,671.99. From the state road tax the amount of $2,213,184.30 was received, and $2,305,312.40 came from the automobile license fees. These two amounts, the principal cash receipts for the year only exceeded the total sum spent on the maintenance of Indiana's state highways by $141,252.86. So it is evident that the roads of the state are eating up the greater part of the annual income in maintenance. The balance of $2,784,605.11 brought forward from the previous year plus $668,939.03 received from inheritance tax, depository interest, sale of non-usable equipment and other miscellaneous items about covered the cost of the new roads constructed. There is a balance of $1,334,155.16 on hand with $419,434.28 of federal aid money earned and to be paid later. Indiana's apportionment of the old federal aid law amounted to $7,415,292, of which only $1,941,621.79 has been received for work completed. Agreements for work that will amount to $6,782,987.88 have been made with the government, leaving an unused and unobligated remainder of the original apportionment of $632,304.70. This does not refer to the approximate two millions of the recently enacted federal aid law, none of which is yet under agreement with the government by accepted projects for federal aid roads.

Variables in Drop Forge Practice

The results of careful experiments in heat treatment of finished forgings are given in this authoritative paper. The author reaches five definite conclusions which are outlined below. He says there are seven possibilities of difference between drop-forgings that are apparently identical.

By J. H. Nelson*

SOME very rapid and stupendous developments have occurred in a large number of industries within the past decade. Chief among these is the automotive industry, which has forged forward from a comparatively inconspicuous beginning to become one of the largest and most highly specialized industries of to-day. One of the principal reasons for this rapid development is the willingness and eagerness with which those in responsible charge seized upon and completely assimilated new ideas and methods that make for better and more rapid production. Many industries have contributed toward this development either directly or indirectly. It is impossible to measure with any degree of accuracy the exact value of each of their contributions. The drop-forging industry, which itself is comparatively young, has contributed in a large measure to this phenomenal advance by successfully forging from steels of various compositions some of the most vital parts that enter into the construction of automotive vehicles. In the early history of the automotive industry, when quantity requirements were small, the cost of drop-forgings was prohibitive to a large extent. The result was that the manufacturer was compelled to resort to castings or hand-forgings to supply his needs. As his requirements increased and designs became more stabilized, he was able to purchase drop-forgings of far superior quality to compete in price with castings and hand-forgings.

Drop-forgings for automotive construction are made to-day in large quantities from a great variety of steels, both plain-carbon and alloy, the particular grade of steel used being dependent upon the part to be forged and the duty required of the part. With the increase in the number of forge-shops that has occurred within the last few years, it is no longer a problem to have a forging made, but rather to secure the necessary quality in the forging when completed; and this matter of satisfactory quality is not something that is apparent on the surface of the forging. Two forgings may be identical in appearance, size, shape, amount of finish and even forged from the same grade of material; yet, from a quality standpoint, they may be decidedly different. This difference may be due to any one or to a combination of the following factors

(1) Method of forging
(2) Method of heating for forging
(3) Inspection and supervision of forging
(4) Inspection of raw stock
(5) Segregation of raw stock
(6) Heat-treatment of the finished forging
(7) Testing of the finished product

It is not the intention to discuss the effects of all of these factors on a finished forging, but rather to confine the discussion to the last four, these having to do with forging materials and their subsequent treatment.

* Chief Metallurgist, Wyman-Gordon Co. Paper presented at the S. A. E. Winter Meeting.

Inspection of raw stock should consist of (*a*) surface inspection to determine the fitness of the material for use in forgings, such as an examination for size, seams, scale, burns and the like, and (*b*) chemical analysis to determine the fitness for use in the various parts, to determine the segregation of the elements in the bars and to determine mixed heats.

Mixed heats are of two kinds, those that are deliberately mixed at the mill and those that are accidentally mixed at the mill. Under deliberately mixed heats, we find steels of the same grade but from different melts that are rolled into bars and furnished to a customer under the same heat number. Such heats are made up from ingots that have the same or nearly the same chemical composition as to the hardening or alloying constituents. Heats of this character are an endless source of trouble to forge-shops that endeavor to keep melts of steel of the same grade segregated. Unintentionally mixed heats are due to a few bars of different grade of steel becoming misplaced. While this is a source of annoyance, it is readily detected chemically and the bars are then rejected.

Segregation of raw stock of the same grade by melts is absolutely essential if quality forgings are to be produced. Many shops and plants fail to recognize this fact and segregate their stock by size and grade only. It not only is necessary to segregate the stock in the yard, but it is equally necessary to segregate the forgings made from this stock until they have been completely heat-treated and are ready to ship to the customer.

The necessity of heat-treating finished forgings can best be demonstrated by our experience on production work. Time and space will not permit of the discussion of the different grades of steels used. The tendency found in the simple carbon-steel summarized in Table 1 holds for all steels, including the more complex alloy-steels. Table 1 gives chemical analyses and physical tests on production work for 107 different melts of a plain carbon-steel purchased under the specification given at the head of the table.

These steels were purchased from a number of different mills and are fairly representative of material selected for our use.

The physical properties given in Table 1 are an average of ten tests selected at random for each melt, the tensile test in every case having been made on a prolongation of a crankshaft that was forged to a diameter equal to the maximum section of the shaft. In our practice this coupon remains attached to the crankshaft throughout the various operations and is used as a check on the heat-treatment operations. One or more such tests are provided for each furnace charge, the number depending upon the number of crankshafts in each charge. The diameters used vary from 2¼ to 2¾ in., according to the particular job that is being forged.

The location of test-specimens was in every case at a point halfway between the outside and the center of the coupon. The axis of the test-specimen was always taken parallel to the axis of the coupon from which it was cut. The test-specimen used conforms to the Society's standard dimensions, 0.505 in. diameter and 2-in. gage-length. The tensile tests were all made on a 100,000-lb. capacity automatic and autographic tensile-testing machine, using the 50,000-lb. counterpoise on the beam. Spherical-seated grips are used in making all tensile tests. The Brinell hardness number recorded was determined on the crankshaft after first grinding and preparing the surface; it does not necessarily indicate the hardness of the test-piece itself.

The crankshafts represented by these tests were all quenched in water from 1525 deg. fahr., and drawn back to the temperature specified. The furnaces used are automatically controlled, use oil for fuel and have a hearth

Table 1—Chemical Analyses and Physical Tests Made on a 0.40 to 0.50 Per-Cent Carbon Steel.

Group A—Drawing Temperature, 980 Deg. Fahr.

No.	C 0.400 to 0.500	Mn 0.600 to 0.800	P 0.045 max.	S 0.050 max.	Yield-Point, lb. per sq. in.	Tensile-Strength, lb. per sq. in.	Elongation in 2 In., per cent	Reduction of Area, per cent	Brinell Hardness No.
1	0.440	0.730	0.010	0.033	77,150	117,600	19.8	50.5	245
2	0.390	0.630	0.015	0.038	72,875	111,550	20.0	52.1	237
3	0.400	0.620	0.016	0.050	72,700	109,300	21.7	53.0	230
4	0.420	0.680	0.015	0.051	73,600	108,400	18.0	50.3	242
5	0.500	0.580	0.008	0.043	72,000	108,475	19.8	50.7	236
6	0.440	0.670	0.010	0.043	76,800	112,000	21.3	54.9	241

Group B—Drawing Temperature, 1,000 Deg. Fahr.

7	0.480	0.800	0.015	0.048	76,350	115,600	21.9	53.0	233
8	0.470	0.650	0.009	0.044	76,950	115,425	20.4	50.6	233
9	0.420	0.680	0.019	0.044	76,300	113,200	20.3	53.3	241
10	0.410	0.660	0.015	0.040	78,350	115,950	20.0	52.7	237
11	0.390	0.690	0.019	0.042	74.700	110,700	21.6	52.9	238
12	0.420	0.740	0.014	0.038	77,775	115,500	21.9	54.1	236
13	0.430	0.700	0.015	0.039	81,350	122,800	19.6	53.0	241
14	0.400	0.620	0.019	0.035	78,300	117,100	20.3	51.2	238
15	0.480	0.680	0.016	0.034	80.200	118.325	19.8	52.4	238
16	0.410	0.780	0.027	0.042	75.150	112.625	22.2	55.4	241

Group C—Drawing Temperature, 1,020 Deg. Fahr.

17	0.460	0.740	0.014	0.034	74,575	110,400	21.2	55.8	234
18	0.430	0.740	0.018	0.032	75,625	114,250	21.5	53.3	236
19	0.470	0.630	0.014	0.046	77,200	116,600	22.2	52.5	230
20	0.470	0.630	0.017	0.053	75,450	115,450	20.4	51.7	238
21	0.480	0.730	0.020	0.043	76,250	114,900	21.5	52.6	238
22	0.540	0.630	0.020	0.039	82,400	122,800	21.1	51.5	238
23	0.470	0.740	0.018	0.058	79,200	118,000	22.4	53.8	240
24	0.430	0.590	0.016	0.031	76,400	113,900	22.8	56.0	241
25	0.510	0.750	0.028	0.034	78,450	117,250	21.7	54.5	239

Group D—Drawing Temperature, 1,040 Deg. Fahr.

26	0.500	0.650	0.022	0.048	78,800	117,370	19.5	50.6	239
27	0.490	0.750	0.015	0.040	77,420	114,200	20.7	51.8	236
28	0.480	0.700	0.024	0.042	78,000	119,400	20.9	52.3	239
29	0.520	0.700	0.018	0.046	76,500	115,600	20.1	53.4	241
30	0.500	0.560	0.022	0.046	75,350	114,175	19.8	51.2	238
31	0.500	0.690	0.018	0.042	79,500	116,350	21.2	53.7	241
32	0.500	0.690	0.016	0.041	76,150	116,350	20.0	50.8	238
33	0.480	0.820	0.019	0.053	79,780	118.500	20.3	52.3	241
34	0.470	0.720	0.015	0.042	75,100	113,900	20.3	50.2	235
35	0.420	0.680	0.019	0.044	76,300	113,200	20.3	53.3	241
36	0.480	0.640	0.022	0.012	77,425	116,125	22.8	54.3	238
37	0.440	0.660	0.022	0.039	79,960	118,120	20.8	53.0	241
38	0.520	0.830	0.031	0.041	77,400	112,900	21.0	55.2	243
39	0.510	0.710	0.042	0.045	78,300	116,600	23.4	55.8	240
40	0.480	0.650	0.124	0.046	79,870	118,200	20.3	52.3	236
41	0.480	0.820	0.025	0.056	76,275	114,800	21.0	52.9	239
42	0.490	0.660	0.026	0.052	78,850	116,600	22.0	52.5	237
43	0.460	0.780	0.009	0.053	75,450	113,125	23.2	56.5	233
44	0.470	0.800	0.014	0.045	77,400	115,500	22.6	55.0	233
45	0.400	0.880	0.010	0.048	76,250	112,850	21.8	55.6	237
46	0.450	0.700	0.036	0.043	74,900	114,000	22.3	53.4	235
47	0.400	0.830	0.026	0.046	79,000	117.400	22.8	55.2	241
48	0.460	0.750	0.017	0.043	78,650	116.750	23.0	56.5	234

Group E—Drawing Temperature, 1,060 Deg. Fahr.

No.	C 0.400 to 0.500	Mn 0.600 to 0.800	P 0.045 max.	S 0.050 max.	Yield-Point, lb. per sq. in.	Tensile-Strength, lb. per per cent	Elongation in 2 In., per cent	Reduction of Area, No.	Brinell Hardness
49	0.500	0.700	0.021	0.043	79,850	118,100	20.7	51.0	235
50	0.450	0.680	0.018	0.054	78,150	116,000	20.3	52.1	241
51	0.480	0.630	0.026	0.042	77,925	116,900	21.6	53.9	241
52	0.470	0.700	0.028	0.040	76,325	113.125	21.3	55.6	233
53	0.480	0.820	0.028	0.053	79,550	117,400	20.4	54.9	240
54	0.470	0.780	0.030	0.042	76,850	115,750	22.1	54.0	237
55	0.400	0.890	0.012	0.048	76,250	112,850	21.8	55.6	237
56	0.490	0.610	0.013	0.031	73,500	107,700	22.9	57.5	233
57	0.470	0.700	0.033	0.031	81,200	119,310	20.8	53.0	243
58	0.440	0.780	0.035	0.051	76,870	115,600	22.4	54.5	239
59	0.430	0.650	0.022	0.036	75,950	113,000	23.3	55.5	237
60	0.460	0.690	0.032	0.051	76,600	113,950	22.0	53.6	240

Group F—Drawing Temperature, 1,080 Deg. Fahr.

61	0.460	0.810	0.017	0.043	79,270	118,500	21.0	54.0	238
62	0.520	0.580	0.026	0.049	76,250	115,900	21.2	56.7	237
63	0.480	0.640	0.022	0.054	77,370	117,100	20.8	52.5	239
64	0.480	0.730	0.034	0.046	80,500	119,900	20.3	50.0	238
65	0.480	0.700	0.033	0.056	79,200	116,500	20.0	53.6	233
66	0.450	0.680	0.018	0.054	77,750	117,150	19.7	51.1	242
67	0.490	0.750	0.026	0.055	77,500	115,900	22.3	55.4	235
68	0.480	0.650	0.025	0.042	79,600	117,900	20.9	52.1	238
69	0.450	0.730	0.027	0.043	82,187	121,000	19.7	51.7	241
70	0.440	0.760	0.025	0.049	79,600	119,300	19.9	52.2	242
71	0.450	0.610	0.023	0.040	78,750	114,700	20.7	54.2	245
72	0.460	0.740	0.039	0.040	79,270	115,500	20.5	54.1	242
73	0.480	0.630	0.040	0.043	77,000	113,950	21.1	52.7	247
74	0.460	0.830	0.034	0.047	76,500	113,000	21.4	54.0	246
75	0.490	0.770	0.028	0.041	79,450	118,500	22.4	54.2	237
76	0.430	0.790	0.021	0.043	81,400	120,900	21.6	52.9	241
77	0.470	0.760	0.022	0.046	82,000	121,700	19.5	51.9	242

Group G—Drawing Temperature, 1,100 Deg. Fahr.

78	0.480	0.730	0.014	0.039	78,250	117,625	21.8	55.9	237
79	0.460	0.730	0.015	0.036	78,350	115,300	21.6	56.0	244
80	0.460	0.690	0.041	0.048	75,100	113,900	20.6	52.2	243
81	0.440	0.760	0.023	0.049	77,100	112,500	21.1	56.2	243
82	0.420	0.790	0.034	0.046	75,200	112,160	22.1	54.5	241
83	0.500	0.660	0.030	0.037	76.970	116,100	20.3	52.8	241
84	0.480	0.690	0.039	0.051	76.600	112,950	21.5	57.0	246
85	0.430	0.920	0.038	0.038	76,200	113,900	24.0	57.3	238
86	0.430	0.810	0.027	0.032	77,900	115,000	23.5	57.2	241
87	0.400	0.850	0.035	0.046	78,600	117,120	22.9	54.6	242
88	0.460	0.610	0.034	0.039	75,650	113,600	23.6	57.6	238

Group H—Drawing Temperature, 1,120 Deg. Fahr.

89	0.460	0.740	0.039	0.040	79,300	115,500	20.5	54.1	242
90	0.500	0.780	0.033	0.041	82,250	120,650	19.9	55.0	248
91	0.440	0.820	0.028	0.044	78,950	110.500	22.5	59.7	243
92	0.460	0.690	0.032	0.043	81,000	118,750	21.1	53.5	247
93	0.450	0.880	0.036	0.034	79,450	115,950	21.7	57.5	243
94	0.480	0.740	0.033	0.043	77,750	115,200	22.0	54.8	241
95	0.400	0.700	0.033	0.043	74,700	110,000	22.4	57.1	241
96	0.500	0.800	0.035	0.047	82,150	119,300	20.8	54.3	246
97	0.480	0.680	0.025	0.037	77,750	115,850	21.7	56.6	239
98	0.420	0.850	0.038	0.042	77,750	113,550	22.3	59.7	243
99	0.440	0.860	0.031	0.037	78.500	117,000	21.8	57.2	247
100	0.440	0.950	0.025	0.055	75,500	111,100	21.2	57.1	240
101	0.480	0.710	0.033	0.055	80,200	117,900	21.3	54.4	247
102	0.420	0.870	0.035	0.048	83,000	120,625	21.6	54.1	243
103	0.460	0.790	0.036	0.042	81,000	118,425	21.8	54.2	240
104	0.460	0.700	0.035	0.043	79,000	118,000	21.3	52.5	243
105	0.450	0.690	0.029	0.048	75,250	111,500	23.1	56.0	239
106	0.440	0.630	0.028	0.046	76,250	113,650	23.6	57.8	237
107	0.490	0.750	0.026	0.051	78,200	114,800	21.4	56.4	243

dimension of 66 x 98 in. The temperatures were all measured by an iron-constantin thermocouple pyrometer system, which was checked constantly by a master pyrometer used exclusively for this purpose. The control mechanism, which is very positive in its action, is responsive to changes of 5 deg. in temperature between fire-off and fire-on. The charge of any furnace can be held for any length of time at any predetermined temperature, without danger of over-running as in hand-fired furnaces. This insures accuracy in heat-treating operations.

The values given in Table 1 have been grouped according to the drawing temperature necessary to meet the following specification:

Yield-Point, lb. per sq. in.	70,000
Tensile-Strength, lb. per sq. in.	100,000
Minimum Elongation in 2 in., per cent	18
Minimum Reduction of Area, per cent	50
Brinell Hardness	228 to 248

A study of the results given in Table 1 would lead to the conclusion that the chemical composition of the steel in question is not a complete criterion of the heat-treatment to be specified to meet the requirements of a definite specification. We see that the steels reported require a drawing temperature varying from 980 to 1120 deg. fahr. to bring them within the limits specified. The uniformity of the results obtained in the various groups is exceedingly striking, as is also the uniformity between the various groups.

This latter uniformity is more evident in Table 2, where the averages of the various groups given in Table 1 are summarized. This summary brings out more clearly that the variation in the drawing temperatures necessary to bring these various heats of steel to the common specification cannot be ascribed wholly to the difference in the chemical composition of the heats. The variation in the average carbon and manganese-content of these steels will not account for the large variation in drawing temperatures.

Table 2—Average of Values Given in Table 1.

Group	Drawing Temperature, Deg. Fahr.	C 0.400 to 0.500	Mn 0.600 to 0.800	P 0.045 max.	S 0.050 max.	Yield-Point, Lb. Per Sq. In.	Tensile-Strength, Lb. Per Sq. In.	Elongation in 2 In., Per Cent	Reduction of Area, Per Cent	Brinell Hardness, No.	Number of Tests Averaged
A	980	0.430	0.650	0.012	0.043	74,280	111,220	20.1	51.3	228	60
B	1,000	0.430	0.690	0.016	0.041	77,540	115,900	20.8	52.8	238	110
C	1,020	0.470	0.690	0.018	0.041	77,300	115,950	21.6	53.6	236	90
D	1,040	0.470	0.730	0.021	0.044	77,500	115,750	21.3	52.9	238	230
E	1,060	0.460	0.710	0.024	0.042	77,420	114,980	21.6	54.3	238	120
F	1,080	0.460	0.710	0.028	0.046	79,100	117,200	20.8	53.1	240	170
G	1,100	0.450	0.750	0.021	0.042	76,900	114,600	22.1	55.2	241	110
H	1,120	0.450	0.770	0.032	0.044	78,500	115,750	21.7	56.0	243	190

It does not require much play of the imagination to visualize the condition of a charge of steel made up from each of these groups and treated as a single melt. Such, however, is the condition when stock is kept only by size and grade. This condition can also exist in a heat of steel that is intentionally mixed at the mill. The chemistry of the steel, as has been shown, is not a sufficient criterion to allow any person to prescribe heat-treatments with any degree of accuracy. The only safe way to determine this is by actual experimentation for each melt of steel used.

The test applied to finished forgings is a series of either tensile or Brinell-hardness tests, the latter being more extensively used. For quality forgings, both should be used. It is comparatively easy to treat any heat of steel to meet either of these two tests when used separately but, when both conditions are to be met at the same time, the task becomes somewhat more difficult and with some melts of steel it is impossible. When the Brinell-hardness test only is used to test forgings, nothing short of at least one Brinell test on each forging should be countenanced. If this is not done and the various melts of steel used are not segregated throughout the yard and shop, some poorly treated forgings are sure to be the result.

Summary

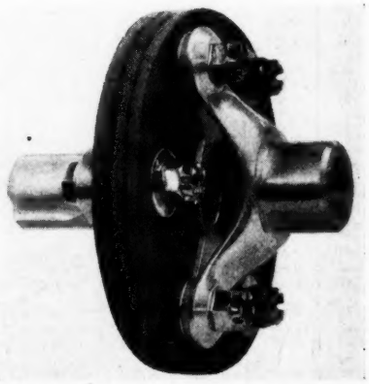
(1) Steels of the same grade and of the same chemical composition do not respond in the same way to heat-treatment
(2) To heat-treat with minimum loss, only steels from the same melt should be included in a furnace charge
(3) Stock subjected to heat-treatment should be carefully segregated into piles of the same melt; it should be kept segregated throughout the entire process of fabrication to produce satisfactory forgings of uniform quality
(4) Tensile and hardness tests should be required on all heat-treated forgings to check the thoroughness with which the various heat-treatment operations were performed
(5) At least one hardness test should be made on all heat-treated forgings to insure that all have responded to the heat-treatment operations in the same manner.

Fabric Universal Joint with Centering Member

A DISK joint has been added to the line of metal universal joints which has been manufactured by the Arvac Mfg. Co. for the last five years. The new disk joint will be manufactured in three sizes, intended to cover the entire passenger car, speed wagon and light truck field and a large percentage of heavier truck installations between clutch and transmission.

As shown in the accompanying illustration, the design includes a centering member which is claimed to keep the propeller shaft concentric and to minimize vibration by supporting the metal parts of the joint in a positive manner, causing them to revolve about a true axis—all of which tends to increase the life of the disks.

The centering member consists of a centering ring carrying a non-metallic, sound deadening, oilless, replaceable bushing supported by three radial arms which securely lock it in a concentric position on the flange-spider bolts. The centering shaft is pressed into the tubular spider and has a spherical surface, providing for both angular and longitudinal movement. The flange spider hubs are turned to S. A. E. standards. Torsional strain is removed from the tube weld by a patented process of swaging the tube back of the weld into slots or keyways milled in the tubular spider hubs.



Arvac disk joint with centering member

The Effect of Impact Forces on Road Pavements

The force of impact blows, as delivered by a road impact machine, can be expressed as an equivalent static load. This offers a means of comparing the resistances of paved sections when subjected to impact. The impact force must be obtained from space time curves. The methods explained.

By C. A. Hogentogler*

IN connection with tests of impact by the wheels of motor trucks on road pavements there is considerable disagreement on such questions as the relation of maximum to average force produced during a blow as well as the connection between static and impact forces. It is true, there are fundamental theoretical formulæ for deriving the force of impact as well as energy work relations for determining average resistance; but when the impact force values are obtained, what do they mean and how do they help us?

What is desired is a knowledge of the effect produced by these forces. In other words, we would like to compare the effects produced by given impact forces with those produced by static loads. To do this, the impact force must be obtained from space time curves by means of theoretical computations, and then a relation must be found between the force and the equivalent static load. For obtaining usable impact values from the curves the following general relations were tried:

1. The maximum force produced by an impact blow is equal to the greatest acceleration times the mass of the moving body.

2. The average force of an impact blow is equal to the average acceleration during time or distance of contact times the mass of the moving body.

3. The average force of an impact blow is equal to the total energy of the blow divided by the distance through which this energy is expended.

The first attempt to secure the force of the impact exerted by a drop of the plunger on a copper testing block was made with autographic curves secured during the first calibration of these blocks. Since all authorities seem to agree that the maximum force of the blow is exerted at or near the point of greatest deformation a position near the lowest point of the curve was selected for the solution. An enlarged typical space time curve and the graphical solution used in this derivation are shown in Fig. 1.

The relation used was:

$$F = Ma.$$

In which,

F = maximum force of blow,
a = maximum acceleration,
M = mass of unsprung weight.

To obtain a, the following formula was used:

$$a = \frac{V_1 - V_2}{t}$$

In which,

t = time in seconds,
V_1 = velocity before the point of maximum deformation,
V_2 = velocity after the point of maximum deformation.

The procedure, as shown in Fig. 1, was first to draw a horizontal line through the curve near its lowest point. Tangents were then drawn to the curve at its intersection with the horizontal line. These tangents or first derivatives gave the values V_1 and V_2, while the time was given by the length of the horizontal line contained between the two sides of the curve. Because of defects in the autographic recording device the results from this set of computations were of value only in so far as they indicated that dependable results could be secured from curves of proper size with correlated accurate time records. While the actual results were not usable, it was strongly suggested that a definite relation existed between the force as computed and the equivalent static load as given by the copper cylinder.

For a further investigation of impact force, several defects were eliminated from the recording apparatus, and the impact machine was loaded with 3050 lb. unsprung and no sprung weight, the plunger being in effect a freely falling body. The sprung weight was eliminated in this calibration in order that the velocity as obtained by the tangent method might be checked by the theoretical velocity of a freely falling body. The procedure in securing deformations of the copper cylinders was the same as that followed in the first calibration described above.

For deriving the impact forces from the curves the method used involved the assumption that the maximum velocity of a falling body which is being stopped by a cushion occurs when the body has penetrated the cushion to such a depth that the resistance of the cushion equals the weight of the body. An inspection of curves, of deformation of rubber tire and copper cylinder under static loads showed that a resistance of 3050 lb. occurs with a deformation of 0.225 of an inch, and it was therefore assumed that the maximum velocity of the plunger occurs at a distance of 0.225 of an inch below the point of first contact and becomes 0 at the lowest tip of the curve. The average acceleration can be expressed in two ways:

1. Ave. $a = \frac{V}{t}$

V = maximum velocity,
t = time required to change from maximum to 0 velocity.

2. Ave. $a = \frac{V^2}{2D}$

V = maximum velocity,
D = distance from point of maximum velocity to lowest or point of zero velocity.

*Highway engineer, Bureau of Public Roads.

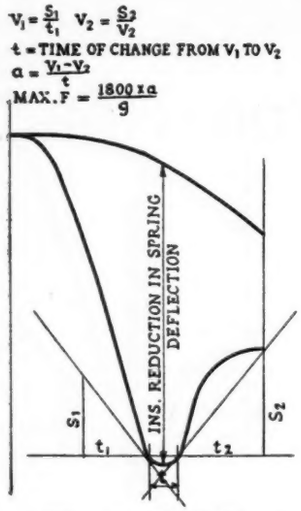


Fig. 1 — Derivation of maximum acceleration from space time curve using the velocity-time relation

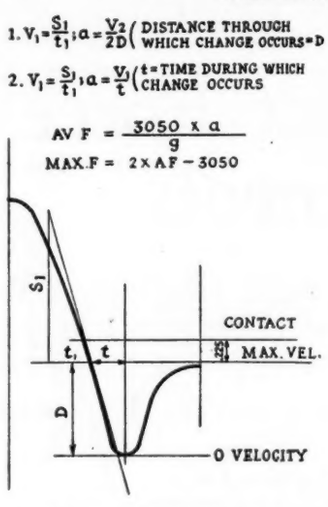

1. $V_1 = \frac{S_1}{t_1}$; $a = \frac{V_2}{2D}$ (DISTANCE THROUGH WHICH CHANGE OCCURS = D
2. $V_1 = \frac{S_1}{t_1}$; $a = \frac{V_1}{t}$ (t = TIME DURING WHICH CHANGE OCCURS
AV F = $\frac{3050 \times a}{g}$
MAX. F = 2 × AF − 3050
S_1
CONTACT
t_1
t
MAX. VEL.
D
0 VELOCITY

Fig. 2 — Derivation of average acceleration between points of maximum and zero velocity

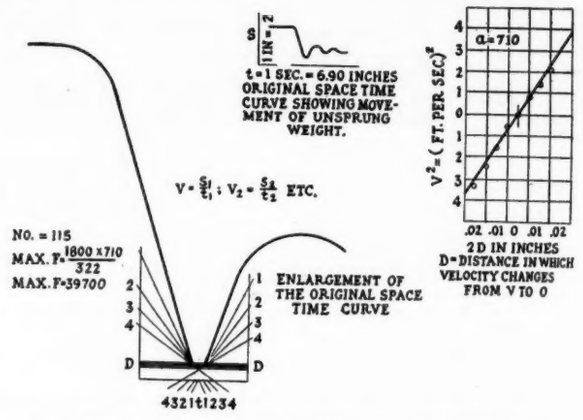

S
1 IN. = 2
t = 1 SEC. = 6.90 INCHES
ORIGINAL SPACE TIME CURVE SHOWING MOVEMENT OF UNSPRUNG WEIGHT.
$V = \frac{S_1}{t_1}$; $V_2 = \frac{S_2}{t_2}$ ETC.
NO. = 115
MAX. F = $\frac{1800 \times 710}{322}$
MAX. F = 39700
ENLARGEMENT OF THE ORIGINAL SPACE TIME CURVE
D
4 3 2 1 1 2 3 4
a = 710
V^2 = (FT. PER SEC)^2
.02 .01 0 .01 .02
2D IN INCHES
D = DISTANCE IN WHICH VELOCITY CHANGES FROM V TO 0

Fig. 3—Derivation of the maximum acceleration from the relation AV2D

Fig. 2 shows how the values are taken from the curve. From the tangent is obtained the maximum velocity; the time, t, is the horizontal distance from the point of tangency to the lowest tip of the curve, while D is the vertical distance from the point of tangency to the lowest tip of the curve. Having determined the average acceleration from the curves the average force, R, is obtained from the relation $R = Ma$. It is noted that R is the average force exerted from an initial force of 3050 to a maximum to be determined.

The second assumption is expressed by the relation

Max. $F = 2R - I$,

R = average force,

I = force at point of maximum velocity (in these computations, 3050 lb.).

Table 1—Comparison Between Equivalent Static Load as Indicated by the Copper Cylinder and Impact Force as Computed from Space-Time Curves by Means of Both Velocity Squared-Space and Velocity-Time Relations Between the Points of Maximum and Zero Velocity

No.	Copper cylinder static equivalent.	Approximate computed maximum velocity.	Maximum velocity as obtained from tangent to curve.	Velocity squared-space relation.		Velocity-time relation.	
				Ave. $a = \frac{V^2}{2D}$	F=2R—I.	Ave. $a = \frac{v}{t}$	F=2R—I.
1	22400	3.190	3.254	134.5	23450	143.8	24210
2	24400	3.440	3.700	148.7	25090	145.5	24510
3	26000	3.610	3.885	154.2	26150	183.4	31870
4	28600	4.080	4.150	167.1	28610	183.0	31510
5	30200	4.235	4.287	176.2	30310	178.5	33900
6	21500	3.280	3.360	132.0	21950	151.3	25590
7	20000	3.060	3.140	123.5	20350	154.2	.....
8	16500	2.530	2.700	105.0	16850	103.3	17610
9	15600	2.360	2.590	101.6	16200	110.2	17810
10	11100	1.580	1.746	72.4	10670	72.9	10770
11	8600	1.360	1.343	59.6	8250	60.65	8045

Sprung weight=0. Unsprung weight=3,050 pounds.

The comparison of the forces obtained by this series of drops is shown in Table 1. These results clearly indicate that the equivalent static load as given by the copper cylinder is about the same as the maximum force as computed from the curves by means of the above methods. It will be noted that the tangential velocities are slightly greater than the theoretical and also that the forces as computed from the velocity time relation show more variation than those from the velocity space relation. The reason for the latter condition unquestionably lies in the fact that more accurate measurements can be made on the curves for distance than for time.

There is being developed at present by the Bureau of Public Roads a device which when attached to a motor truck will give space time curves showing the movements of the sprung and unsprung parts of the vehicle when passing over different types and conditions of pavements; and owing to the fact that the curves made by this apparatus can be solved by methods making use of the tip of the curve only, the next step in the development of force derivation involved the securing of the maximum force by means of the maximum acceleration. In the derivation of the maximum acceleration, the velocity distance rather than the velocity time relation was used, since previous study showed that space measurements were more accurate than time measurements. In the study of this method of force derivation the curves obtained during the investigation of the effect of copper cushion reduction were used. It will be noted that these curves represented drops on different sizes of copper cylinders as well as drops in which no cylinders were used. The maximum acceleration was computed from these curves and with this acceleration a maximum force was obtained from the formula:

$$Max.\ F = \frac{1800 \times a}{32.2}\ \text{(lb.)}$$

In which,

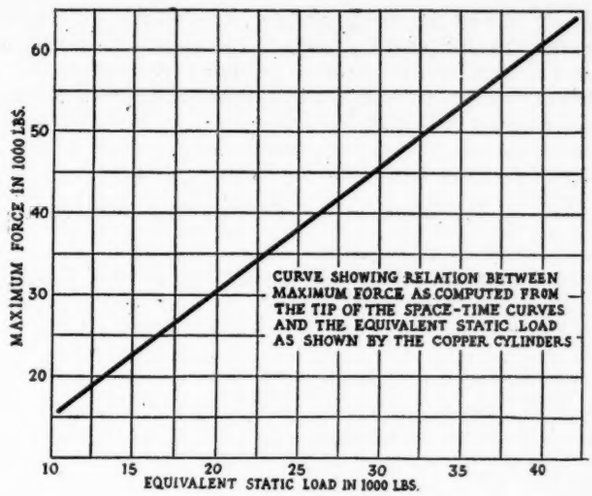
1800 = unsprung weight (lb.),

a = acceleration (feet per second per second).

The procedure was as follows: Each curve was enlarged 10 times by means of a precise pantograph (see Fig. 3). Four horizontal lines were then drawn through the bottom part of the space time curve, these lines representing distances of one two-hundredth, one one-hundred-and-fiftieth, one one-hundredth, and one-fiftieth of an inch from the lowest point, or point of zero velocity. Tangents to the curve for obtaining the velocities were drawn at the intersections of these horizontal lines. These velocities were squared and plotted as shown in Fig. 3, in which the vertical distances are the squares of the velocities and the horizontal distances are the above noted distances from the point of zero velocity. Through these points as plotted a line is drawn which is the slope of the $\frac{V_2}{2D}$ curve. The slope of this line equals a, the acceleration.

Having found the maximum force, the next step is to determine just what this force means. In other words, what is the actual effect produced by a maximum impact of a given magnitude.

A means of determining this effect is afforded by the copper cylinders. By comparing the maximum impact forces as computed from the space time curves with the static loads which cause equal deformations of copper, a definite relation is found between the two, which is shown


MAXIMUM FORCE IN 1000 LBS.
EQUIVALENT STATIC LOAD IN 1000 LBS.
CURVE SHOWING RELATION BETWEEN MAXIMUM FORCE AS COMPUTED FROM THE TIP OF THE SPACE-TIME CURVES AND THE EQUIVALENT STATIC LOAD AS SHOWN BY THE COPPER CYLINDERS
Fig. 4

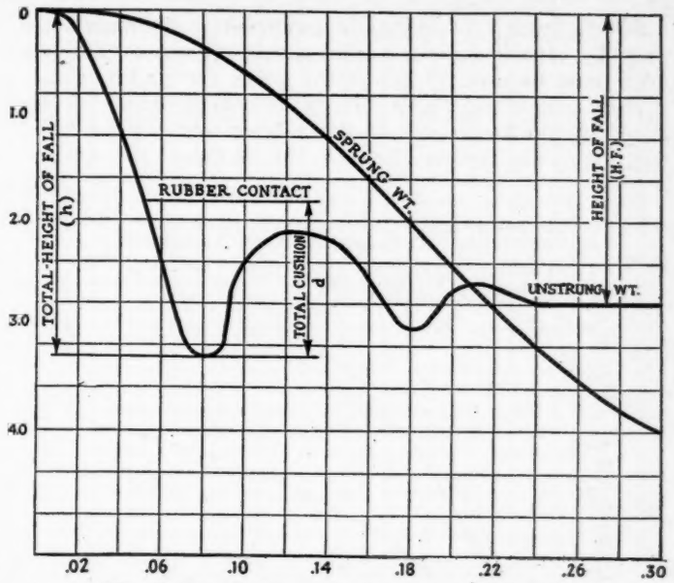


Fig. 5—Space-time curve showing energy-work relation

in Fig. 4. From this curve it will be seen that a maximum force causes the same deformation as would be occasioned by a static load of approximately two-thirds the magnitude. Having determined this relation, an equivalent static load can be found for any maximum impact force, and, knowing the maximum impact force when no cylinder is used, it is a simple matter to find the corresponding equivalent static load.

Table 2—Comparison of Equivalent Static Load as Obtained from Copper Cylinder Deformations with Maximum Force as Computed from Space-Time Curves

$$M = \frac{1800 \times a}{32.2}$$

No.	Maximum acceleration (*a*).	Maximum force.	Equivalent static load by copper cylinder.	Free fall (H. F.)	Remarks.
		Pounds.	*Pounds.*	*Inches.*	
26	297	16,600	12,500	0.25	½ by ½ cylinder.
25	313	17,500	13,200	.34	¾ by ¾ cylinder.
51	423	23,600	16,600	.40	¾ by ½ cylinder..
4	555	30,740	21,700	1.08	½ by ½ cylinder, 1st blow.
4	582	32,600	23,700	1.07	½ by ½ cylinder, 2d blow.
4	625	34,950	25,300	1.04	½ by ½ cylinder, 3d blow.
62	833	46,700	32,600	1.74	¼ by ½ cylinder.
55	556	31,000	22,000	.63	1 by ½ cylinder.
5	750	42,000	[1]29,800	1.12	No cylinder.
103	608	34,000	[1]24,500	.72	Do.
106	1,019	57,000	[1]39,100	2.91	Do.
101	967	54,100	[1]37,400	2.28	Do.
110	722	40,350	[1]28,700	1.06	Do.
115	705	39,400	[1]28,100	1.08	No cylinder; Time doubtful.
100	324	19,000	[1]14,100	.24	No cylinder.
112	857	47,900	[1]33,500	1.80	Do.
107	1,052	58,800	[1]40,100	3.04	Do.
26	414	23,150	[1]17,100	.28	Do.

[1] Equivalent static load computed.

The values shown in Tables 2 and 3 were obtained by first computing the maximum force and finding the corresponding equivalent static load from the curve. As noted before, it has been known that as the depth of cushion is decreased the impact increases. This effect or increase is shown very clearly in Table 3.

It must be remembered that this investigation of the impact blow was carried on only for the purpose of determining the equivalent static load in the absence of the cushioning effect of the copper cylinder. The close agreement of the above results has been accepted as justification of the use of the no-cylinder curve to represent the values with the effect of copper cushion eliminated. It must be pointed out, however, that these conclusions and the results are neither final nor absolute. They are accepted only because nothing better has been offered. There are several possible sources of error in the curve computations. First, the time cannot be considered as accurate. Autographically, the time intervals are recorded only in seconds, while the computations deal with hundredths of seconds and even smaller intervals. The average time as shown on the graphs in which one second is represented by from 6 to 9 in. horizontally might not be exact for the interval of contact. Again, it is impossible to enlarge the small curves with the degree of accuracy necessary for exact solution of velocities. The slightest variation in the enlargement means a large error in the computed velocity. This explanation and the details of the procedure used are given so that the results can be taken for what they are worth.

What can be said then from the above results is that the maximum force at the tip of the curve completed by the mass acceleration method, as shown, produces the same effect upon a copper cylinder as a static load of approximately two-thirds the magnitude. Knowing this, then, these curves become valuable for measurement of force.

By far the simplest solution of the curves secured during the slab tests is that making use of the energy work relation. When the plunger of the impact machine or the wheel of a motor truck falls through any distance,

Table 3—Investigation of Effect of Reduction of Copper Cushion on Force Produced by Same Height of Fall

Percentage of increase of force produced when using rubber alone against that of rubber and ½ by ½ inch copper cylinders

Free fall (H. F.)	Equivalent static load as shown by copper cylinders. ½ by ½	¾ by ¾	¾ by ½	1 by ½	1½ by ½	No. cyl.	Per cen Increase
Inches.							
0.25	**12,500**	**13,000**	**13,800**	**14,500**	**15,000**	15,100	20.7
	0.143	0.070	0.045	0.016	0.007		
.50	**16,600**	**17,600**	**19,300**	**20,200**	**21,600**	21,700	30.7
	.202	.114	.078	.030	.014		
.75	**19,200**	**20,200**	**22,000**	**23,400**	**25,700**	25,700	33.8
	.230	.140	.097	.038	.019		
1.00	**21,300**	**22,300**	**23,800**	**25,600**	**28,400**	28,400	33.9
	.250	.160	.109	.045	.023		
1.25	**22,900**	**23,500**	**25,200**	**27,100**	**30,200**	30,300	32.3
	.265	.178	.118	.050	.025		
1.50	**21,300**	**25,200**	**26,400**	**28,300**	**31,500**	32,100	32.8
	.271	.193	.127	.054	.027		
1.75	**25,500**	**26,300**	**27,300**	**29,300**	**32,300**	33,500	31.3
	.278	.204	.133	.058	.028		
2.00	**26,400**	**27,200**	**28,100**	**30,100**	**33,300**	34,900	32.3
	.283	.213	.137	.060	.030		
2.25	**27,100**	**28,000**	**28,900**	**30,700**	**33,900**	36,200	33.5
	.286	.222	.144	.062	.030		
2.50	**28,000**	**28,700**	**29,500**	**31,300**	**34,300**	37,400	33.6
	.291	.228	.148	.064	.031		
2.75	**28,600**	**29,400**	**30,200**	**31,800**	**34,700**	38,500	34.5
	.293	.236	.152	.065	.031		

a certain amount of energy is developed by the mass acted upon by gravity as well as the spring pressure. This energy must be used up before the wheel can be brought to a stop. In other words, the total energy must be balanced by the resistance of the rubber tire, copper cylinder, slab, etc., acting through the distance of total deformation. Referring to the enlarged space time curve (Fig. 5) showing the movement of the unsprung weight it is noted that the total energy of the blow is equal to total drop (h) times the weight of the plunger plus the average spring pressure exerted on the plunger falling through the distance (h). This energy is expended on an average resistance acting through the distance (d). The average resistance is obtained from

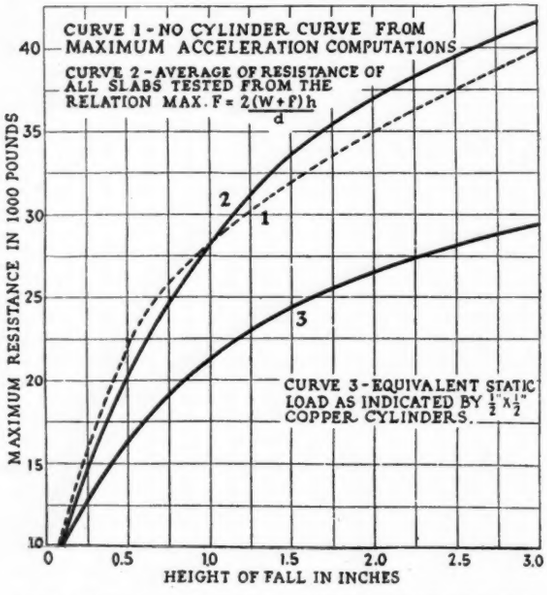


Fig. 6—Curves showing the relation of computed values of static equivalent loads and the static equivalents as measured by copper cylinders

$$R = \frac{(W + f)\ h}{d}$$

In which,

R = average resistance,
W = 1800 = weight of plunger,
f = average spring pressure acting through distance (h), which value is obtained from Fig. 7,
d = total depth of deformation,
h = total height of fall.

In this case as in the preceding one, the average resistance is of value only when its effect can be expressed in static terms. An examination of the results indicated that the equivalent static effect on the copper cylinder was expressed by the relation

$$\text{Equivalent static load} = 2R - P$$

P becomes zero when the height of fall (h) is greater than the cushion (d). When $h = d$ (in small drops with rubber in contact with slab) the value for P is taken from the rubber deformation curve and is equal to the static load necessary to deform the rubber the amount it is deformed at the beginning of a particular blow.

The equivalent static load as given by the copper cylinder and the maximum force as obtained from the above formulæ are in very close agreement, the average variation being 2.5 per cent. Results with copper cylinders were obtained with the machine loaded in three different ways, viz. (1) with a sprung weight of 6000 and an unsprung weight of 2000 lb.; (2) with a sprung weight of 6000 and an unsprung weight of 1800 lb. and (3) with a freely falling unsprung weight of 3050 lb.

From the foregoing results it is apparent that a definite relation exists between the force of impact as computed from the space time curves and the equivalent static load as indicated by the copper cylinder. It will be noted also that while the impact force, computed by the several methods has different values, a definite relation is shown between each value and the copper cylinder values, thus making the curves of practical use as a means of measurement of force. The indications are that the average force of impact as derived from the curves is one-third the maximum as derived from the tip of the curve, and the static load which produces the same deformation of copper is double the average or two-thirds of the computed maximum.

It will thus be seen that we have been able to express impact in terms of an equivalent static load and through this medium of expression we are enabled to compare the intensity of impact exerted on road slabs tested as already described.

In curve 3, Fig. 6, the equivalent static load is shown as given by the ½ x ½ in. copper cylinder. Curve 2 is the average curve developed from the space time curves taken during the tests of different slabs at Arlington. Curve 1 is the curve worked out by the acceleration method for the equivalent static effect of the blow when no cylinder is used, and while there is no relation between the methods used for curves 1 and 2, they agree within about 5 per cent.

The close agreement of curves 1 and 2 furnishes sufficient proof that a definite relation exists between the effect of impact force and equivalent static load. Curve 1 gives the relation between the equivalent static loads as shown by the copper cylinders while curve No. 2 is twice the average impact forces as computed from theoretical formulæ. The difference between curves 2 and 3 represents the effect of the copper cushion. The ½ x ½ in. copper cylinder values corrected by these differences represent the equivalent static loads which could be expected if no cylinder were used. From the foregoing it can be seen that there is ample evidence to warrant the assertion that the force of impact blows as delivered by the road impact machine can be expressed as an equivalent static load, and thus is secured a means of comparing the resistances of pavement sections when subjected to impact.

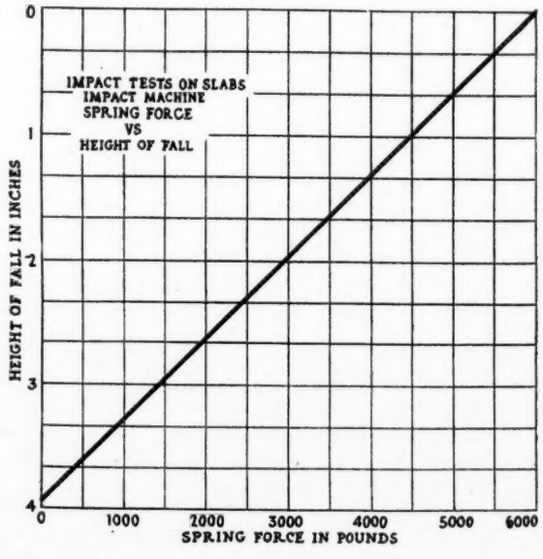


Fig. 7—Average spring pressure for various heights of fall

The Venezuelan Market for Motor Vehicles

An actual need exists in the important cities for omnibus transportation and the cattle areas offer a market for trucks. Road improvement is in a process of rapid development and touring will soon become more popular. Railways are inadequate to take care of increased transportation burdens.

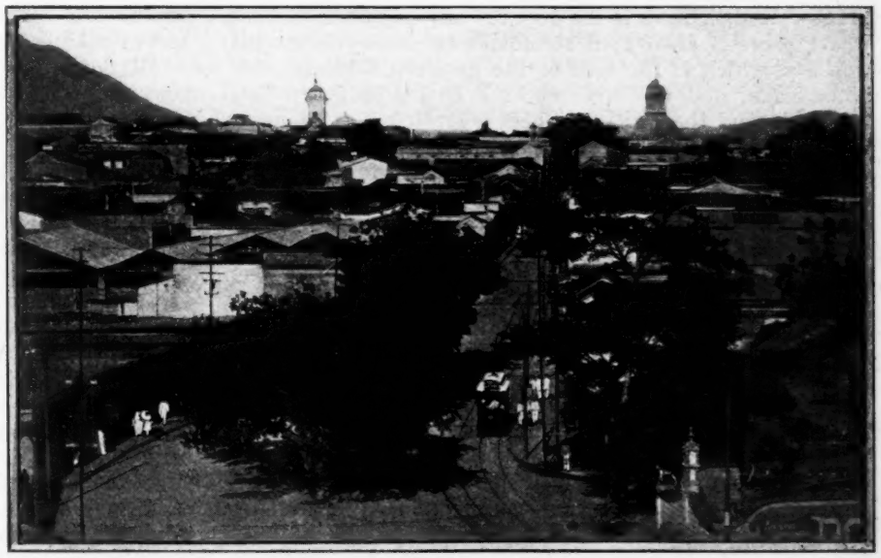
By Harry Chapin Plummer

MOTOR car, omnibus, taxicab, motor truck and tractor opportunities in the Republic of Venezuela are closely linked with the economic vitality and progress of that nearest of all South American nations to the mainland of the United States. Venezuela is vastly more dependent upon motor transportation than is our own country, because the railways and electric trolleys there have been developed in nothing like the ratio to the population and area that the rail and electric lines in the United States have been developed. Even the 1000 miles of superbly constructed, but indifferently maintained, English, German and native railways and the very few urban trolley lines, had accomplished but a feeble and perfunctory advance of the national welfare up to 1910 and 1911. It was in these latter years that the start was made upon the building of the magnificent network of motor highways, now totaling about 2900 kilometers, which in the ensuing decade has well nigh galvanized the social and business life of the natal land of Bolivar.

From the facts as here presented the inference might be drawn that the roads of Venezuela offer an immediate opportunity for the motorist from the North to embark upon a tour of the republic. In theory this is possible; in practice it cannot be counseled. Several reasons, chiefly physical, operate to discourage such an idea at the very outset.

In the first place, the long-bodied, ample-roomed touring car of the de luxe type is, by reason of its length, its breadth and its low structure, ill-suited to the Venezuelan road system, wherein the frequent sharp turns and very steep gradient place such a type of vehicle at a disadvantage—at least until time has been allowed for adjusting its physical conformity to the new conditions confronting it. The Ford, the Hudson-Essex and the Buick five and seven passenger cars, and other similar cars, have proved their adaptability to the peculiar contour of the country traversed by the main trunk line and lateral highways of Venezuela. Nor even can the owner of one of these several makes expect to encounter a free and unrestricted field for operation. Many peculiar local and natural factors are automatically set against him. At certain seasons, the rains; not a deterrent to travel over the central highways before designated, but one to be reckoned with by the motorist unacquainted with the roads and the topography of the country. At other, and almost all times, the mist and fog in the mountains and the startlingly abrupt changes of temperature experienced over relatively short stretches of territory. And always there is the consideration of difficulties arising from travel after dark, which may overtake one in runs, the duration of which, both as to distance and time, may have been underestimated. These details are suggested not to discourage, but rather to encourage, the idea of motor travel in Venezuela, by stressing the need for intelligent preparation and prior understanding. When intelligent preparation marks the initial stage of a motor tour of Venezuela, the maximum of safety, comfort and pleasure is sure to follow.

Motor trucks are brought into the country, as a rule, for purposes specifically different from those that actuate the importation of passenger cars, and usually, too, under a more preconcerted, if not contractual, arrangement. The experience of the road engineers employed by the Venezuelan Ministry of Public Works has proved that the three-quarter to 1 ton, or even 1½ ton truck is the type of commercial vehicle best adapted to the average highway of the republic. It is true that trucks of much larger weight capacity are employed in and about the principal cities, but for interurban traffic and long runs, and especially for use on the roads traversing the mountains, the smaller,



Cement paved thoroughfare with trolley in Caracas

more compact type is conceded to present the greatest measure of utility.

There are few omnibuses owned or operated in Venezuela, but it is no exaggeration to state that the field for that type of vehicle is one of the best in the world. A very few small buses were put into operation some years ago and they have since continued to ply regularly between the Capitolio, in the center of Caracas, and Petare, a populous and picturesque suburb some twelve or thirteen kilometers out. These buses seat not more than fourteen persons—the seats run lengthwise—but during the "rush hours" of early morning and late afternoon traffic and on Sundays and feast days they carry twenty-five passengers within and on the steps and not a few on top and at intervening times a sufficient number on each trip "to keep going." And this despite the fact that the buses operate in competition with a well-equipped railway line which maintains a half-hourly passenger service in each direction between Caracas and Petare and at a lower fare than that charged by the buses.

Buses Needed in Some Cities

There has long been friction between the Federal Government and the monopolies controlling telephone, electric light and trolley services in Caracas. These concerns are owned by British capitalists. Although the city has an almost ideal trolley system, with a five-cent fare and generous transfer privileges and a well-maintained schedule, it is no common secret that the Government is seeking the first pretext to terminate the "stranglehold" it avers the Britons have obtained upon the public utilities of the capital. When the time arrives that any inroads can be made by the Government upon the trolley service, buses, without doubt, will be the medium employed as an entering wedge, since legal and physical limitations—the latter imposed by the narrow streets and a fast-growing automobile traffic—would render impracticable the construction of new and competing trolley lines. Even if a threatened *coup* of this nature does not materialize the degree to which bus lines could serve the newly populated outlying sections of Caracas are many and obvious.

A like condition prevails in Valencia, where an English corporation operates a north-to-south and east-to-west trolley franchise, but leaving large and thickly populated areas within the squares formed by the arms of this traction cross without anything like adequate transportation service. Several important growing suburbs would benefit greatly by bus lines. Another populous center in even greater need of buses is the big port city of Puerto Cabello, where there is always an abundance of money in circulation and which is the seat of the *astillero nacional*, combined naval and military machine shops, shipyards and dry dock, and the British-owned *congelacion de carne*, or refrigerating plant. Great numbers of well paid, skilled workmen are employed in these and other factory establishments in Puerto Cabello and all live considerable distances back from the waterfront, where the factories are located. At present they walk to and from work. That city has long been a "live" trolley prospect; it is an even better potentiality for bus traffic. The railway station in Puerto Cabello is about a mile from the custom house, steamship landing and the several hotels about the waterfront, and nothing but the hired touring car is now available for transportation between these important points. Trains arrive twice daily at Puerto Cabello from Valencia, while there is an average of daily arrivals of trans-Atlantic and coastwise steamers.

The real "bonanza city" for the installation of a motor-bus service, however, is Maracay, capital of the State of Aragua, residential seat of the President-Elect and Dictator, Genera Juan Vicente Gómez, and an industrial center ranking second to Caracas. Many important Government offices and bureaus are located at Maracay, which is virtually the garrison city of the republic for the Venezuelan army. As in Puerto Cabello, the railway station is several blocks distant from the large hotel, which happens to be "Venezuela's least worst" and equally so from the residential section about the hotel.

Taxicabs are an unknown quantity in the Venezuelan cities, yet a condition exists to-day which presages the early advent of these public carriers. The present hired vehicle for getting about Caracas is an old French landau type styled a "coche" and drawn by a single horse and afflicted with a gong which the driver insists upon sounding at every revolution of the wheels. It is obsolete and cannot survive. It was in its hey-day when Caracas, not so many years ago, was an ill-paved, ill-lighted, unsanitary city and something light was needed to negotiate the cobblestones here and the ruts and lakes of mud there. In those days one took a chance with one's life and limb in venturing out of the city proper into the suburbs in any way save on horseback. Now the beautiful Paraiso, a modern boulevard, and any number of admirable avenues and roads tempt the average person to a motor-run at night.

The only alternative for the busy man by day or the pleasure seeker by night is the limousine hired from a public garage. These are availed of to a considerable extent, but their expense and size are such as to render them unsatisfactory.

Possibility of Taxi Installations

Infinitely better than the slow, old *coches*, a taxi of the type familiar to the big American cities could compass the attractive city and suburban drives by day or night and prove to be much swifter and more satisfactory for business uses during bank and office hours.

Maracay, Valencia and Puerto Cabello should prove to be excellent centers for the establishment of taxi services, while La Guaira, the chief seaport, has its bonafide opportunity for this class of vehicle in the fact that two important resort communities—Macuto, "the Newport of Venezuela," and a very attractive seashore place, and Maiquetía, a rendezvous for Caracas' folk of wealth and leisure when cool weather prevails in the capital and, besides, an active industrial center—are within a quick taxi run, in opposite directions, of the steamship dock, custom house, railway station and business section of La Guaira, one of the foremost of Venezuela's commercial centers. A trolley line operates between these three places, but it serves mainly the laboring element and holiday crowds.

Although the English railway extending between Caracas and La Guaira is a never-failing "gold mine" for its shareholders, because of the constantly increasing traffic between the two cities, within a very few years there has been a steadily growing number of travelers between Caracas and American and European centers which have come to make the trip of 36.5 kilometers (it is only about nine kilometers, as the crow flies) by motor car over the magnificently constructed zig-zag road. This because of the stunning views to be obtained, the greater comfort and the time saved. It takes a little more than two hours to accomplish the journey by rail; a little more than an hour by motor-car.

The rate of depreciation of automobiles and motor trucks in the republic is higher than in the larger countries of the North, but it is not greater than in many parts of both the United States and Canada, where road conditions are considered to be good, especially in mountainous and hilly sections of those countries. If a vehicle is maintained and used principally for touring or service in the chief Venezuelan cities and on the main highway

system of the republic, and granted that it receives proper care and attention upon the part of its driver, not only on the road, but in the garage and at times when it is not actually running, and provided, also, that worn mechanism and parts are replaced and cleaning and oiling are constant and regular, it should wear well for almost as long a period as in any but the most highly developed road regions of North America.

The surface of the Venezuelan roads, in and about Caracas and the Federal District, Valencia and Maracay, is generally of cement or macadam, and on the longer stretches of rural roadway a gravel is employed, which, being resilient, exacts no undue strain upon either machine or tires. The grades and the curves, without doubt, are depreciatory factors, yet granted that these are negotiated with no more of the caution and care than are essential to the physical protection of the driver himself and the occupants of the car, they will not prove to be serious deterrents to the maintenance of a car in a satisfactory condition.

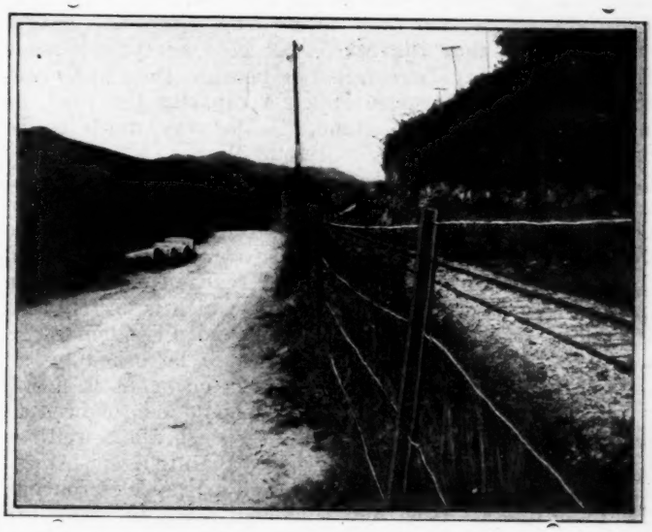
Engine over-heating is a common occurrence, due to the intense heat of the sun upon the metal forestructure of the automobile and the fast running over level stretches and downgrades and the friction incident to hill-climbing.

In the cities outside of Caracas the rate of depreciation will depend entirely upon the extent to which a car is run on the streets outside asphalted or otherwise well-paved areas. In Valencia or Puerto Cabella, for instance, it will be found to be possible to maintain a car in admirable condition for almost an indefinite period, provided the poorly paved streets, the number of which is being quickly reduced in those two communities, are avoided. This is true, probably in an even greater degree, of Maracay, and, certainly, it is equally true of La Guaira and Macuto and Maiquetía.

Motor trucks naturally are subject to a greater degree of depreciation in the cities of the interior than are passenger cars, since it is the streets in the "downtown," or business section of each community, having cobbled pavements or being mere dirt roads more or less neglected and subject to furrowing by heavy rains in the season, that they have to negotiate. Nevertheless, Caracas, Maracay and Puerto Cabello, three of the best paved cities in Venezuela, will show any number of trucks, up to five tons capacity, of varying sizes and makes, that have long served their owners and are continuing to do so because of the clean, level, cement or oiled natural dirt thoroughfares over which they are operated.

First of Venezuela's economic problems is cattle raising; the second is cattle transport. Extreme difficulties lie in the way of the successful movement of livestock from the vast, sea-like grazing areas far in the interior to the tide-water outlets at Puerto Cabella and Ocumare de la Costa —the latter a new free port but recently established by the Government.

The grazing lands begin at points within thirty kilometers south of the Caribbean coast-line, on the upland *llanuras* immediately beyond the mighty wall formed by the coastal spur of the Andes Mountains, and extend for hundreds of kilometers over those *llanuras*, over a second and smaller range of mountains, and over the *llanos*, or great plains, to the Orinoco and the Apure, Arauca and other tributaries of that great stream. Of course, by far the majority of cattle are raised on the *llanos* proper, far to the south of the *llanuras*, or highland plains, and the second range of mountains referred to. A fair proportion of cattle find their outlet through Ciudad Bolivar and other Orinoco ports, whence they are transported by steamer to the British Island of Trinidad, off the Venezuelan coast and the Delta of the Orinoco. At Port-of-Spain they are slaughtered in a large British plant. The major number of cattle, however, move northward over the *llanos*, as the dry semestre draws to its close, and converge at a point called "La Boca de los Llanos," (the Mouth of the Llanos), approximately 165 kilometers from the coast. They have come from the *llanos* under an equatorial sun, usually under conditions of drought and dust and the long journey on the hoof has spelled but one thing—depreciation. Thenceforth this is increased, because the benefits of the cooler and more moist climate of the higher altitude are offset by literal climbing of the interior range of mountains. Then they must continue their "run" across the *llanuras*, under trying conditions of temperature and atmosphere, to the great coastal range and thence to Puerto Cabello or Ocumare they encounter a climb, followed by a steep descent, that reduces their qualities as beef pretty nearly to the minimum by the time they enter the run-way to the killing establishment



Many of the best roads parallel railway lines. This will aid rather than hinder truck transportation development, however, since the railways are constantly becoming less capable of handling traffic between major commercial points

at the former city or reach the point of embarkation at either port.

Three splendid lateral motor highways extend from Caracas, Maracay and Valencia, the chief cities of the *llanuras*, to their respective seaboard gateways, La Guaira, Ocumare de la Costa and Puerto Cabello, but the grades, the frequent curves, the marked changes of temperature between the starting point on the *llanuras* and the apex of the watershed and between the watershed and the coast ports, the danger of loss by the falling of animals over the dizzy edges of considerable stretches of the roadways, as, also, from reckless driving of motor cars on the roads, render the movement of cattle on the hoof one of increasing hazard. In fact, there now is relatively little livestock traffic between Caracas and La Guaira, that being no longer an outlet for the industry and automobile and vehicular movement having become so dense as to imperil animals en route. Next in this respect comes the road between Valencia and Puerto Cabello, which is the main artery for cattle to the coast to-day. The Caracas-La Guaira railway and the Valencia-Puerto Cabello railway transport very little livestock.

By reason of a negligible volume of other traffic and the fact that the Maracay-Ocumare highway, but lately completed, was built expressly with the idea of the accommodation of cattle in mind, that road offers much better facilities for their passage on the hoof. However, the refrigerating plant at the port thus far has only been projected, while the volume of stock "run" to Ocumare

for ultimate shipment from that point up to date has been inconsequential.

Extraordinary as it may appear, for some time plans have been seriously considered in Venezuela for the building of an aerial cable line between those two points, by which two or three animals might be taken at a time in cages up the appreciably sharp ascent from Maracay to the *cumbre*, or summit, and then, by a much sharper descent, to the ship's side at Ocumare. The greatest secrecy attended the examination—a secrecy so profound that every man, woman, boy and girl in the republic shared it.

Of course the motor truck will be found to be the solution of this problem, because the cost of adequate railway facilities over the route in question would be prohibitive in these days of soaring material and labor figures.

Spasmodic attempts have been made, always at "long distance," by one or two American motor truck manufacturers to develop this interesting situation, but it is understood that the reason all bids heretofore made from this country have failed is because they have contemplated five-ton trucks. Such a capacity the road, as constructed, would not stand. It is very much to be doubted if the Ministry of Public Works, which is the deciding factor in the case, would sanction the use of trucks greater than 2½ tons, and two-ton trucks probably would come nearer the mark. But between these two figures a vehicle eventually will be evolved and designed that will economically and efficiently realize this vital issue in the Venezuelan livestock industry, which is largely controlled by General Gómez, Dictator and President-Elect.

If the hypothetical question were to be asked by an American manufacturer of passenger or business motor vehicles as to the procedure that should be followed to realize a market in Venezuela, the response would well be: send down to that country a scout, an intelligent American trained in the mechanics, as well as the sales routine, of the business. Give him time and scope to study the situation and to report back. Have him survey the remarkable industrial field in the "motoring area" of the republic—the coffee, sugar, cacao, balata (rubber), wood, cotton and tobacco production, the cattle raising and the fast sprouting manufacturing activities—and try to arrive, in each instance, at the existing type of vehicle most suited to the needs of that industry, considering its peculiar physical operations, its environment, and all related questions of climate, altitude, the topographical formation of the country about the seat of the industry, road structuring and conditions, the nature of labor to be depended upon for the use, the care and the upkeep of the car, and like details of a relevant and pertinent character. After the mechanical specialists and export departments have developed a "program," send down the highest executive of the organization that may be spared to develop a "point of contact" with the business interests in Venezuela to be singled out for service. Big contracts in Venezuela can be underwritten only by a man having the experience and business knowledge, and, even more important, the immediate authority to act without useless cabling and detailed correspondence. That man must be one of standing and prestige and social qualities. It is infinitely better that he speak the language, but that is not imperative. Business has been done in Venezuela by men who scarcely could order their breakfast in Spanish. Good fellowship and a nice regard for the amenities of society are a prime factor in supplanting the specific appeal of a given product and credit considerations.

There are American and native wholesale and retail houses of the highest rating and proved responsibility to which agencies may be allotted by correspondence after the usual investigation. But the most satisfactory and lasting business results are to be secured, even if through the agency, by the visit to the country of an accredited representative of the manufacturer whose executive position at home may be shown to be so exalted as not only to command the respect and attention of the business interests to be invited to trade, but to create a sense of implied recognition and compliment in the delegation of one of the actual principals to the making of connections in that particular and very desirable market, now only in the infant stages of development by the American automotive industries.

Automobile Factories Wanted in Jugoslavia

AMERICAN capital, machinery and executive talent could well be employed in Jugoslavia, according to a report from Consul Thomson at Zagreb. Automobile factories are among the ones specifically mentioned as being industrial plants for which there is an urgent need. American capital is especially desired, the report points out, because no political motives are suspected and confidence is accorded to American business men. Furthermore about 700,000 native workmen from the district have their homes in the United States and the great influx of their money remittances to relatives at home is one of the financial assets of the region.

With regard to labor conditions in Jugoslavia, a government order limits hours of labor to eight a day in plants employing more than five men. The price of labor, at present rates of exchange, runs from 50 cents to $1.50 a day. Strikes are unusual and all strikes having a political or radical socialistic tendency are forbidden by the government. Six months imprisonment may be imposed upon any person who attempts to prevent others from working.

A foreign firm desiring to work in Jugoslavia must first organize itself in the form of a joint-stock company and register before the competent court in the district where the business is to be located; a concession to operate the business must be secured from the Government at Belgrade, Serbia. Relatively high taxes are imposed in connection with these formalities and, in addition, there are local communal taxes. Export restrictions include heavy export duties and taxes upon the volume of business of the exporter. Under existing laws an exporter must give a guaranty that he will bring into Jugoslavia the equivalent, in foreign values obtained abroad, of the goods exported. These various minute regulations, subject to frequent changes without notice, constitute the only serious barrier to American capital in Jugoslavia.

The steady depreciation in local exchange has a tendency to reduce the price of labor and other costs, if such costs are calculated in American or British currency. It also decreases the purchasing power of the local population with respect to purchases of American goods.

Sierra Leone Improving Roads

AT present the number of cars and trucks running about Freetown, Sierra Leone, only totals 100, says a British Colonial report. Outside Freetown, nothing but light vehicles can operate. The Protectorate, equalling South Carolina in size, is gradually extending its road system, and motor highways are receiving special attention. Sierra Leone has many rivers capable of carrying vessels of shallow draught, and motor boats should find a market.

What Some Dealers Are Thinking

All of the speeches during show weeks were not made by factory executives. Some dealers had their own little talk to make. They didn't get up and speak out in meeting, but they told it to one another rather freely. Here is what a few had to say when talking together informally.

IT is sometimes possible and always helpful for car manufacturers to achieve the expressed desire of Bobby Burns:

"Oh wad some power the giftie gie us
To see oursels as ithers see us!
It would frae monie a blunder free us,
And foolish notion."

It is advantageous to know the honest opinion of those with whom we are doing business, even though we feel that there is good reason for disagreeing with that honest opinion in various ways.

There have been many luncheons and dinners tendered by manufacturers to dealers within recent weeks, and at these gatherings many interesting conversations have taken place that were not audible to those at the speakers table. The conversation which took place between a group of some six or seven dealers within speaking range of the writer at one of these functions is worth presenting to the manufacturers as rather typical of the sentiments that were heard elsewhere during show week. For the sake of facility in presentation the words are put into the mouth of a single dealer, although the sentiments were endorsed by the other dealers present. The function was held by a well-known manufacturer of a standard make car; a manufacturer who has been recognized throughout the industry as an intelligent merchandiser and a sound conservative business man. And here is what this typical dealer had to say:

"That was a great meeting we had in the other room, wasn't it? The sales manager gives us a long talk about how to sell cars; he talks about merchandising methods; the proper way to demonstrate the car we are selling.

"Then the chief engineer tells us about the wonderful mechanical developments which have been made in the car; talks about new models and the excellent product which is being given us to sell.

"But, did you hear a word about used cars? Not on your life! The used car is the only thing that is worrying us right now. If they can tell us how to get rid of the stock of used cars we have on hand, we can sell the new ones quick enough. I don't have to use any special selling or demonstration methods to sell the Sennett car. A man comes into my salesroom and says, 'How much will you give me for this old tin can of mine?' If I give him what he wants, the sale is made.

"I can't take any more used cars in trade. I've been bled white, and so has every other dealer I know. We made big profits a year or so ago, but the factories have taken them away from us. We've been cleaned out right.

"The sales manager just announced that the factory had been operated at 70 per cent of capacity during 1921 and thanked us for our help in making the record possible. I'll say we helped. Do you know what that 70 per cent meant to us dealers. It meant that we tied up all our money in used cars and that we are through now. I wonder what they think they are going to do during 1922. They can't bleed us any more; we don't have the money and the banks have shut down on us. And this is the situation with every dealer in my town.

"We had to take the cars they shipped us. And we paid cash for them. The factory is cold-blooded about it. If you don't take them, you lose your dealership.

"This company has the highest type dealers in the business, but I'll bet there isn't $100,000 in real money among the whole crowd.

"Assets? Yes, they have plenty of assets in the form of used cars, but they can't realize on them. I can't possibly afford to take a used car in trade.

"My quota for 1922, given me by the factory, is 100 cars. At the very best I can make thirty sales to people who have not owned cars before. The profit from these sales will not pay my overhead. And I can't afford to trade on any basis, because I can't get rid of my used cars and have to pay cash for the new ones.

"Could I get rid of those used cars and be on a sound basis for going forward if I didn't have to take any cars for six months? Yes, I could. And I could go ahead all-right if, after having a chance to clean out my present stock, I had cars given to me at the rate at which I could reasonably be expected to sell them.

"There is one thing. The dealers in this organization have a real car to sell and if we can ever get over this used car situation, we will be all right. I wish the factory would stop publishing this house organ designed to tell us how to sell cars and give us pep and take that money to help us out on the used car situation. These dinners and things are all right, too, but they aren't doing us any good. The factories have got to give the dealers a chance to get out from under their used car stock. The situation is the same with all the dealers I know. The used car is the only thing that we are interested in just now."

There is another side to this situation, of course, and the sentiments of this dealer are not entirely justified. Nevertheless, the fact that many dealers feel just this way makes an understanding of this viewpoint of vital interest to every automobile manufacturer. It is with this thought that the opinion is presented.

Unfavorable Taxicab Rules in Calcutta

THE use of American motor cars rated at more than 20 hp., and with a turning radius of more than 30 feet, as taxicabs in Calcutta, is endangered by a local rule put into effect as of November 1, by the Municipality of Calcutta.

The American Consul in Calcutta was requested by the Automotive Division of the Bureau of Foreign and Domestic Commerce to protest a rule excluding taxicabs which exceed 20 hp. R. A. C. rating, and 30 feet turning radius, as soon as this proposed legislation was learned of. The American Consul has not been successful in his endeavors as yet.

Common-Sense Methods Mean Automotive Prosperity

This practical timely speech takes its place alongside Norval Hawkins's recent "Service" talk as one of the really significant utterances concerning the automotive industry. Grant says manufacturers must be prepared to operate at a profit and at the same time sell less units if they are to succeed in the next few years. Ways and means are outlined.

By R. H. Grant*

I BELIEVE that we can look forward into the future with optimism. Let us examine the case and see whether we have any grounds for coming to that conclusion. In order to do that we must go back to 1914. This is old stuff; you have read it lots of times; you have thought it lots of times, but in order to make the picture complete and see whether I can build my case it is necessary to get this as an underpinning and a background.

In 1914 this country was having a hard time to sell goods. At that time I happened to be sales manager of the National Cash Register Company. We had a good selling force, a powerful selling force, but we were having a difficult time in disposing of our product in the quantities that we used to, because the retail merchant to whom we sold was in difficulties. The reason that he was in difficult straits at that time was because we had a new tariff law which had just become effective, and this country was being flooded with goods and we could not keep our own factories running. The goods from abroad were taking the place of the goods that we formerly manufactured in 1911, '12 and '13, and those of you who were sales managers at that time may remember that in October of 1913 we began to find a resistance such as we had not found since 1907.

Along in 1915 that condition all changed. Why did it change? Because the war started, because the countries of Europe were engaged in a battle and quit sending any goods to this country. There was a tariff wall set up, the strongest we had ever known—an artificial one because it was caused by the fact that the shops over there were not thinking about turning out things to sell to us; they were thinking about winning the war.

On top of that there was a demand such as we had never known before for our goods, and we began sending them across the ocean as fast as the ships would carry them.

On top of that there came higher wages, a larger purchasing power on the part of domestic consumers. So we stood in a position, from 1915 until after the Armistice, of shutting off the importation of goods that we had previously bought in other countries. We were shipping tremendous quantities of all sorts of goods abroad; we were in such a state of prosperity and wages were so high that the consumption of the people at home was increased very materially over what it had ever been before.

*General manager, Delco-Light Co. Condensed from a paper read at the annual Chicago dinner of the S. A. E.

Under such circumstances it was a matter of whether or not we could fill the orders. We were in the strongest sellers' market that we had ever seen.

The Armistice was signed. It should have been evident to all of us that conditions would change. We slowed up, we watched and waited, and we got a little different condition for two or three months, and then all of a sudden we got considerably more business than we did before.

In analyzing the situation we had forgotten that in filling the demands of Europe we had been holding back our domestic filling of orders. Consequently, that wonderful period that came after the first slowing up after the Armistice came on account of the fact that there was a delay in taking care of home consumption. We took care of that home consumption, and economic principles began to act.

We got just as busy as we could to create all the sales activity we could. Most of us were not in shape at that time to do anything with the prices. Most of us had big fixed charges to take care of. We expanded, our properties were bigger, maybe we had some borrowed money. We were just in that condition in many instances where it took that anticipated bunch of sales to carry along these expansive methods and these large organizations so we woke up in January with this in front of us: we have got to cut our overhead. Some people hopped away back in the fall, and if not back in the fall, at least in January, and cut their overhead as low as they could and got their operations on the safest and soundest basis they could, and they took every means at their disposal to decrease their inventories and get down to some kind of a reasonable inventory basis.

They began to do the sound thing, and that was a sounder thing by a great deal, even though it entailed hardship and loss and was one of the most difficult things that the managers of business in this country ever had to do; nevertheless it was a sounder, saner thing than we did in the previous fall, early in the fall when we should have been doing that thing but hoped against hope that this tremendous volume of sales would come. Well, we have been through a year of that liquidation and it has been a hard, tough year in many, many instances, but we have done wonderful jobs, generally speaking.

I want to say that the plant to-day that cannot sell less product before it comes to the turning point between profit and loss is in a very bad way.

Now as to that optimism business. We have been through a period of liquidation. It started in the basic materials. It hit wool and leather and cotton and copper and such basic things before it hit the articles that we sell. It has been going on and on until in foreign production and in a lot of our basic materials we are practically down to pre-war prices.

As to the consumption abroad of our products, there is one cause for great optimism that exists, and that is that in the consumption of basic raw materials, the shipments to Europe have fallen off in quantity but very, very little.

On farm products, which I happen to know more about than other things, being in the farm business, there was only 6 per cent less of grain that went to Europe in the first nine months of 1921 than in the first nine months of 1920. There was a falling off of values, to be sure, because the stuff didn't cost so much, but there was only 6 per cent less shipped; in other words, Europe has not been hit so hard but what she still has a vast purchasing power for those raw materials that she absolutely has to have.

If we are going to get prosperous conditions in this country we have got to get the farmer back into buying goods, and the farmer is going to come back buying goods for the reason that a great part of the surplus that is produced Europe will take, and every indication is that she will take just as much this year as she did last year.

Did I think that liquidation was going to proceed completely to its ultimate limit, then I would say it would be two or three years before we could get into the same optimistic frame of mind that we can get into now if we understand the situation.

Along about this spring it looks to me like we are going to take the path of least resistance. Already your wholesale prices are showing a tendency upward. They started a few weeks ago; they tumbled back again; they are going to take another start, and we are going to do business again in fair volume—no boom-time basis, none of your inflation stuff, but prices in certain lines that have not been liquidated will still keep on coming down. We used to be on the tenth story in the war. We have hit down about the fourth story now. We are going to stop a while and do a fair volume of business on the fourth story, and after we have done it there for a few months, we are going to have another slowing up period and come down to the third story and finally one of these days we are going to get down to the ground.

That is the thing that has happened in the past in similar situations. Never did liquidation run to a point where everybody was evened up before business resumed itself again. It won't this time, I believe, and I think if you will consult the best authorities on that subject you will find them in agreement with that principle, and that is why I am optimistic on the coming year.

This is the time when the head of a business ought to be surrounded by at least four good business men working hand in glove with it. I think that in the past we have been too highly specialized in our four departments. My idea of running a business is that there should be a head, then there should be a financial man, then there should be a manufacturing man, there should be an engineer and there should be a salesman. I believe that in our past operations great extravagances have often been set up because we had four specialists in that line all working to their own ends and disregarding the interests of the other fellow. To-day we come to a point where those four men should know something about each other's business and they should co-operate and give us the best team play that is in them.

I believe that every business these days should be budgeted. I believe that the comptroller of every business should have passed in to him a statement fifteen days before the month in which the money is going to be spent, showing just exactly what every department head is going to spend. I believe that should be gone over and that the man should not be permitted to spend the money until that budget has been OK.'d and questioned and considered by the comptroller. I don't believe that any man running a business has any right to have a fellow come up to him and say, "I think we need a new floor in here," and reply, "Yes, go on and put it in."

It is my inclination to believe that in the selling end of the business sales are going to be difficult. Sales were difficult in 1911, '12 and '13, but we got a good volume. We were pretty keen as salesmen in those days; we were pretty hard; we were well exercised. We got out of practice during the war; we have got to admit that; things came too easy, and we are pretty much out of practice yet. Some men—I will refer to our own business—absolutely laid down under the conditions and did not try to sell anything; they don't know whether they can or not; they are just overcome, so they are laying on their franchise. Other men were of sterner stuff; they went out and met the conditions and they got results.

What should we be doing in the sales end of the business? First, the management of the business (and, by the way, the chief engineer ought to know something about the selling, and so should the treasurer, as well as other executives) should sit down and analyze what they have got to do. A great mistake that all of us can make this year is trying to do impossible things in selling goods. I can take you to a section of the country where, in our particular business, if you spent $100,000 in sales overhead you would come out at the end of the year with about as many lighting plants as two good-sized fellows could sell under normal conditions. It isn't in the woods in those particular territories. Why should we make the mistake of burning up a lot of money trying to do the impossible thing?

But that is not the general condition. There are thousands of communities where sales can be made. Let us pick them out; let us put the best one at the top and the next one down below and so forth, and get them listed according to their resistance. Let us not burn

HERE are a few of the major points made by Grant in his outline of necessary steps for automotive manufacturers during 1922:

1. **Be prepared to make a profit, although fewer units are manufactured.**
2. **Promote greater correlation of financial, sales, production and engineering departments. The head of each of these departments should have a good working knowledge of the problems of every other department.**
3. **Budget organization expenditures and stick to the budget.**
4. **Analyze markets, and merchandise the product only where it can be sold at a profit. Study is necessary if this is to be done.**
5. **Make only such production changes as will show an immediate saving. Let those changes wait a while which will take ten years to pay for themselves.**

up a big advertising appropriation advertising to dead ones. Let's take that money and advertise to live ones. Let's work the spots that are good for all that is in them just as hard as we can work them.

The main danger that I see in an optimistic attitude as far as sales are concerned is through a lack of that proper analysis and spending a lot of money trying to do the impossible thing. Then when the balance is struck at the end of the year you have spent the money in advertising or in sales effort, but you haven't got the results. So I say let's know our territories and let's demand from the territories where the business is the ultimate in that business. Let's put our money in there.

On the manufacturing end of the business it seems to me that every economy that can be practiced and effected should be put into force. I am not very sympathetic this year with this business of saving a half a cent on some operation and getting a $20,000 machine to do it. I am not very sympathetic with this wonderful expert writing down where operation comes in in its proper sequence if we have got to tear our factory up in order to follow out his instructions and get that result. I am not in sympathy with some change that is merely for looks or for some whimsical reason on the part of one fellow who is not a business man, who takes out one row of machinery and substitutes another in its place which is entirely different. I have had the experience of going away for a couple of weeks and when I came back I went down some familiar aisle and saw something was changed. I said, "Where are those grinding machines?"

"Well, you see, on account of doing such and such we had to take those out and put these in."

"What for?"

"Well, on that operation we save a quarter of a cent." And I said, "Yes, and it will take you a million years to get it back again." I don't want to indicate by that that we should not have breadth in our management. I don't want to indicate that we should not look into the future and that we should not get our costs down as low as we can, but instead of doing it in that highly technical way because we want to show Mr. Manufacturer what a wonderful shop we have got, let's do it in a business way and then probably we won't do it in 1922 at all. Let's take those suggestions, make up a 1923 book and begin jotting down the things that we should be planning on for 1923.

I am not in sympathy with these men writing in books that nobody ever looks into. You go through your place and see a fellow with a huge book with little curlicues all over it; four years ago some fellow originated that book and hasn't looked at it for three years. Let's get that all out.

We used to be guarded to death. Great heavens! we had thirty-four of them, I think, protecting the property. You would have thought the place was made of chocolate and all the kids were going to come in and lick it up.

I think that the engineer can do a lot in this business situation. In fact, I think that it is the engineer's period. I think the engineer can take the place of the promoter. As I indicated a few minutes back, you could get away with murder in business, you could make a thing almost any shape and without any appeal and because people couldn't get good stuff they would take bad stuff. That day is over. We have got to give them the values, we have got to give it to them at the right prices, we have got to sell things that really have intrinsic merit in them and we have to rather take the attitude that with this carafe we are buying the other fellow's money; he isn't buying the carafe; we are buying from him if we are selling him the carafe; we are buying dollars from him with it.

I believe the engineer can help in the situation, first by going to the general manager of the concern and saying, "Mr. Man, I want to get to know something about this business. I think I can help you out if I have got a real business understanding of this whole proposition. I would like to meet with the manufacturing man and find out what it is that I can do to help you most." I will guarantee that there are lots of brilliant chief engineers in this country that are running around without any particular business viewpoint that is so crystallized in their minds that it is right in front of them every minute. We need that co-operation and we need it badly, and if that man at the head of the engineering department gets the right attitude he is going to transmit it to every member of the force because he has lots of men in there that can help him arrive at what he wants to do.

One thing that the engineer can do at this time is to take his past accumulated experience, think it out, analyze it and see what he can do with it to make the product better in the coming year.

In addition to that, I think that the engineer can help very materially by studying every known method of getting just as good a product at the very lowest price. I think he can also help out by analyzing the engineering changes that he wants to put into effect. There are two types of engineering changes. There is the engineering change that should be put in immediately because the service department has indicated to us a weakness in that particular feature. It is constantly bobbing up, we are pouring money out in service as the result of a weakness in that place, and the quicker we can cure that the better. There is the engineering change, therefore, that should be put in immediately because the service department has indicated it, as I say. But there is the other type of change that is done more because theoretically or because of some figuring or other it is a highbrow thing that is better than the one we have got now. Let's put that over until 1923. In other words, let's look at it purely from the customer's standpoint. Is he being properly served with the product as it stands? If he is, then leave it alone; if he is not, then put it into effect.

Great economies can be effected (you men who know production know this is absolutely true) by leaving the product alone. If you are eternally fussing it up, it costs the factory an awful lot of money in constantly changing everything over to suit that particular engineering change. It costs money in shifting machinery. and in changing tools.

Here is another thing: When you fixed that one change you didn't take something else into consideration, and lo and behold, when it got out it wasn't in the right relationship to something else and you had another change to make. It is like smallpox. It breeds fast if you don't look out.

I figure the engineer can help us wonderfully by using the very best of business sense in handling those changes that come through. This last thing does not apply so much to this year; it applies all the time. If the engineer is in touch with the selling end of the business he can make things that appeal to the public a great deal better than if he shuts himself up in an office and doesn't know what is going on. So getting out and seeing the product is the thing that counts. I believe that the engi-

neering department, just as much as possible, should be sent out to service the product.

I look forward to this year being a very much better year than last year. I think a wonderful job was done last year in getting back to earth. That will have to still continue in certain lines, but in the main business is going to improve on a sound basis. Don't take it as the final thing; it has to slow up again, come down again, until we finally get to the point where all things are lined up in proper proportion. Let's understand that situation; let's do our part in getting our product so we can make a profit on less sales than we used to get, because all of us cannot get as many sales as we used to get if there isn't as much buying power as there used to be.

That being the case, we have got to operate our property on the amount of sales that we can get, and if we don't there is only one answer: some of us are going to be eliminated in the shuffle. We want to put it across, and the way to put it across is to be lined up in co-operative team play, every man being a business man, every man, though he is a specialist in his own line, seeing to it that his viewpoint and the thing that he does is in the direction of putting the company where it ought to be.

New Bevel Gear Attachment

MACHINING the forged bevel gear blanks as used in the final drives of automobiles has been a rather difficult job, because of the hardness of the alloy steels generally used in this vital part. After considerable preliminary work The Warner & Swasey Co. have brought out an attachment for their No. 3-A universal hollow hexagon turret lathe, for which they claim that it will materially reduce bevel gear costs. The attachment interchanges with the top slide of the regular carriage, so that the machine may be used part of the time on other work or continuously on bevel gears. In construction the attachment is heavy and rigid, so that cuts up to the limit set by the cutter strength may be taken. It may be set for any angle and the machine will take gear blanks up to 14 in. in diameter.

The operation of the machine with the attachment is as follows: The two tool slides are operated by the hexagon turret and saddle. Rack A, which is mounted on the hexagon turret, engages double pinion B. When the turret is moved toward the head of the machine, rack A revolves pinion B in the direction shown. Pinion B engages rack C and transmits to it a sliding motion toward the rear of the machine and rotates two double pinions D, which engage with racks E fastened to the tool slides. The front slide operates on one side of the gear, the rear slide on the other, and both operate at the same time.

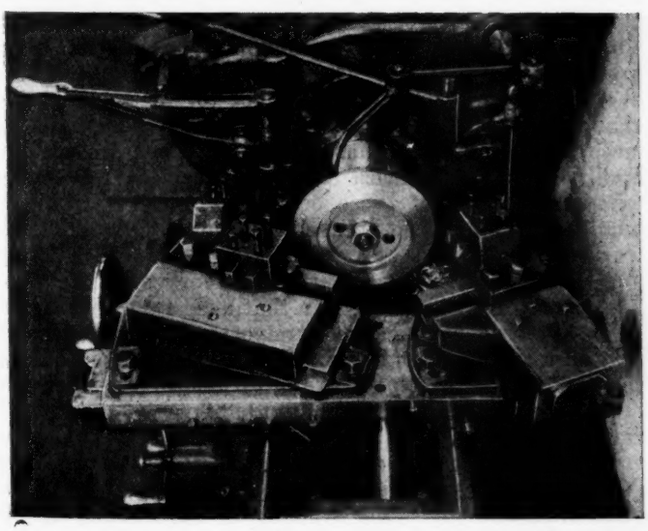
It is believed by the makers that many automobile plants and gear shops can profitably operate a No. 3-A universal hollow hexagon turret lathe with this attachment, either part or full time. A patent on the attachment has been applied for.

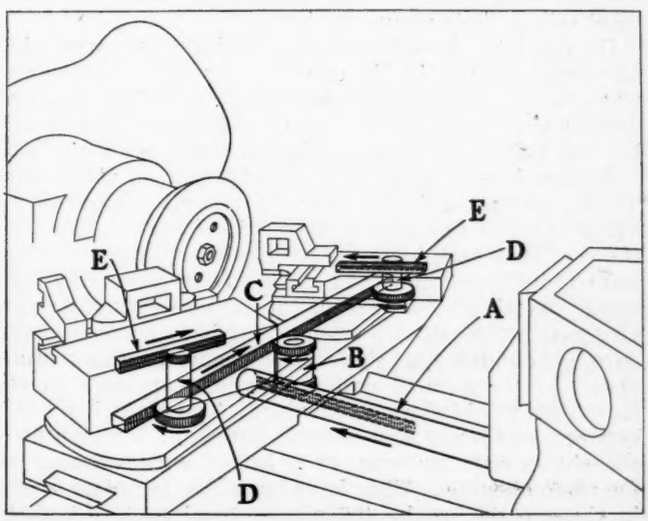
ACCORDING to a statement credited to Captain Guest, head of the British Air Ministry, Germany now has ten commercial air lines in operation, as follows:

	Fare in Marks
Berlin to Danzig and Konisberg	975
Berlin to Bremen and Munster	650
Berlin to Bremen and Wangeroog	650
Berlin to Brunswick and Dortmund	800
Berlin to Dresden	500
Berlin to Leipzig, Nurnberg, Munich and Augsberg	1,725
Hamburg to Magdeburg, Leipzig, and Dresden	700
Munich to Constance	400
Stuttgart to Constance	450
Travemunde to Warnemunde, Sassnitz and Swinemunde	550

Some 6,000 miles are said to be flown daily.

Captain Guest also stated: "The German Government is unquestionably fostering civil aviation, which is, however, at the moment considerably handicapped by the restrictions on the construction of aircraft imposed by the Treaty of Versailles. There are in Germany two main bodies which virtually control all air traffic—the Deutsche Luftreederei and the Nord Deutsche Lloyd. The latter comprises some eight or ten companies—the most important of which are the Rumpler Albatross, Sablatnig and Junker concerns. A large number of societies have been founded throughout the country with the object of stimulating interest in and promoting the development of aviation in all its civil aspects."





Two views of Warner & Swasey turret lathe attachment for manufacture of bevel gear blanks

Experiments in Labor Organization Showing Results

The practical benefits that resulted from establishing personal contact and confidence between management and labor in the days when business was good are shown in times of stress in business circles. Workers, in some cases, voluntarily accepted reduced wages when conditions were explained.

By Harry Tipper

GENERAL discussion concerning labor matters continue to appear in the public press, but these discussions are confined very largely to the question of wage rates and the supposed effect of these rates upon production. Since 1914 many organization experiments have been started with a view to adjusting these matters in the individual organization. These experiments have been in motion for some considerable time now. They are settling down to their practical operation and indicating some of the effects that may be expected therefrom.

Prior to the war for twenty years individual establishments had been conducting business with organizations very different from the usual type and involving some of the changes that were applied more generally during the war. In all cases these organizations had for their object the reduction of "turnover," the settlements of individual grievances, the increased co-operation between employees and employer, and the elimination or reduction of strikes.

In addition to these experiments in individual establishments, plans for the development of improved relations between employers and general bodies of workers were instituted in Rochester, in Cleveland and in other places. These matters have had the attention of general writers occasionally in the magazines and newspapers, and somewhat more frequently in the general industrial papers. They have not been followed very closely, and their progress is likely to be missed by the casual student because they receive little attention and no particular emphasis in their actual workings.

During 1921 the discussion on such matters was taken up almost entirely by the question of wages, particularly wage rates. The relation between wage rates and production costs entered into the discussion to some extent, but not sufficiently to alter the conclusions. Very little reference has been made to the history of wage rates which show a continuous rise, in general, for about one hundred years, and no conclusions have been drawn from the fact that past history does not show any successful wage reductions other than extremely temporary in character and limited in scope. It is interesting to note also that practically no attempt has been made to determine the influence of these experiments in organization upon the wage rates and production condition in the individual establishments involved. The plans instituted between employers and general bodies of workers have not shown any tendency to a better understanding of the wage question. They have been able to adjust wages in these cases to the immediate requirements without the difficulty and unrest caused in other cases. There are no visible indications of a further examination into the wage question or any attempt to put it into the discussion in its relation to production cost. In so far as these general plans provided machinery for the discussion of pertinent subjects between the representatives of the workers and the employers in the locality, they have prevented considerable loss of time and unrest and have improved the general situation. They have not illuminated the question of increased efficiency per man nor the relation between the pace and the production under any particular wage condition.

An important reason for the absence of discussion upon this point has been the increase in efficiency of the individual worker during this depression, an increase which is to be observed whenever employment becomes less than the number of workers to a sufficient degree to bring the fear of unemployment prominently before the individual.

In order to consider the present position of some of these matters it is necessary to turn to the individual establishments and examine the progress they have made under the organization plans effected previous to or during the war. An examination of these matters shows a very considerable variation in the progress of the different concerns. It was to be expected, of course, that those organizations established before the war under the conditions existing at that time would show a greater degree of progress than those established during the stress of war times. These experiments represent only a small percentage of the total number. It is only possible to find one or perhaps two in any industry. Consequently, it might be argued that their success was due to peculiar conditions and not to the organization change effected. The argument is not valid because the mere fact of local circumstances would not provide immunity from labor unrest and the reduction of turnover enjoyed by some of these concerns. Neither would it wholly answer the voluntary reduction of labor by the workers or the voluntary reduction of working hours and the marked improvement in efficiency over the average secured for the industry in that locality or in general. However, it is perhaps more important to consider the several hundred organization changes undertaken during the war period, involving organizations of all sizes and operating in many lines of industry. Some of the organizations making these changes during the war period employed at that time from 20,000 to 40,000 workers and some of them employed only from 500 to 1000. This wide variation gives the student an opportunity to examine the relative progress of the present conditions

and perhaps the general possibilities a little more closely than the earlier experiments that are confined to a few in number and do not embrace the wider variety in size.

In the largest establishments the progress has been much slower in general. This was to be expected of movements having in view a greater measure of human contact, a more effective consideration of human incentive and knowledge, depending for their progress largely upon the inspiration, patience and understanding of those leading and controlling the work. In the larger organization the labor turnover has been more severe, the fluctuations in the total number of workers greater, and the co-operative feeling much more difficult to establish. Nevertheless, the conditions in these establishments show a very definite and marked progress toward a better spirit than that which existed before they were undertaken, and also a better condition than that which is exhibited in the general industry at this time.

The best that can be said about organization experiments in the larger establishments is that they have made sufficient progress to offer encouragement and hope of their future as business gets back to production capacity and the employment becomes more general in these lines, provided, of course, that the changes in control due to the financial conditions do not destroy the organization developments built up during the last two or three years. It is a question whether some of these organizations will continue along the lines adopted at that time because of the changes in financial control and the widespread changes in the executive personnel and the general leadership under which the experiments were started.

In the medium-sized plants employing from a few hundred to a few thousand workers progress is much more definite and its effect upon production and wages much more important in its significance. The period of depression has afforded an excellent opportunity of observing these conditions. The outstanding features in these cases are:

First—The voluntary reduction of their own wages by the workers upon an explanation of the conditions facing them.

Second—The increase of production of the individual so that the reduction of wages was made unnecessary by the reduction in labor cost.

Third—The absence of any unrest or difficulty in the transfer from abnormal employment to subnormal employment and in the voluntary reduction in the number of hours worked by each individual so that a larger body of workers could remain at work a part of the time.

Not all of these effects have been observed in any one establishment, but one or the other has been observed in most of the establishments concerned.

In one of the small plants in the Middle West, manufacturing parts in the heavy metal trades, the owners of the establishment were able to keep it working at a satisfactory production rate because the workers voluntarily agreed to cut their wages and the owners agreed to cut their profit so that prices could be established to the point required to secure the business.

In another plant in the Middle West the workers increased their production pace so that it was unnecessary to reduce the wage scale, and, at the same time, when the unemployment in other factories in the same district became severe they undertook to share the work with those who were unemployed, so that twice the number of workers could secure some income during the severe period.

Instances of this kind have come to our attention in a number of cases, and in every case they have been a result of three primary causes in the factory organization:

1. The existence of a personal contact and confidence between the executives of the factory and the workers.
2. The existence of some form of machinery previously established, whether formal or informal, for the discussion of problems mutually affecting the management and the workers.
3. The development of a part of the reward in accordance with the increased service.

It is the quiet, daily operation of organization in facing the practical necessity that proves the value and indicates the progress. A great deal of discussion occurred when these changes were being made, but the executive in industry could learn more from watching the present progress than from the discussion of the original changes.

Japan Developing Aviation

INCREASED demand for aerial transportation is becoming apparent in Japan, says a report from H. F. Hawley, American Consul at Nagoya, who declares this situation will probably open up sales opportunities for American air-craft manufacturers.

The establishment of an aerial training school in Nagoya, and the organization of a Lake Aerial Excursion Company is contemplated by a civilian aviator of Kyoto. The latter is planning a visit to the United States for the purpose of purchasing a 400 hp. eight-seater plane.

The reopening of a civilian aviation school at Nagoya, which was temporarily closed, is being planned.

The Mitsubishi Motor Company at Nagoya has made progress in the work of manufacturing the new Mitsubishi type of airplane, and will soon be turning out complete machines. The company's application for permission to establish an aviation field in front of its works at the port, has received official sanction.

A trial flight with an experimental airplane completed by these works, and in which a 300 hp. Hispano-Suiza motor was installed, showed satisfactory results. While the details of the machine's construction are kept secret, it is said to be a high speed fighting plane.

Work has been begun by the Aichi Tokei Denki Kabushiki Kaisha (Aichi Clock & Electric Machinery Company, Limited), on a factory in the neighborhood of Nagoya, to which the works of the company, now at Atsuta, will be moved later on. It is expected that it will be completed by the end of 1922. The present works are capable of turning out one airplane a month, of the Yokosho type; the new factory will have a capacity of 50 planes a month. Special attention will be given to the production of large commercial planes.

The Kawasaki Works of Kobe are contemplating the erection of airplane factories in the Gifu Prefecture. Construction was scheduled to be started in November, 1921, and to be completed in the spring of 1922, when 500 workmen will be detached from Kobe to engage in the manufacture of airplanes.

AN Irish automobile show will be held in February, 1923, under the joint auspices of the Irish Automobile Club and the Irish dealers.

AUTOMOTIVE INDUSTRIES
The Automobile
Reg. U. S. Pat. Off.

PUBLISHED WEEKLY
Copyright 1922 by The Class Journal Co.

Vol. XLVI Thursday, February 9, 1922 No. 6

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, General Manager
David Beecroft, Directing Editor
U. P. C. Building, 239 West 39th Street, New York City

BUSINESS DEPARTMENT
Harry Tipper, Manager

EDITORIAL
Norman G. Shidle, Managing Editor
P. M. Heldt, Engineering Editor
Herbert Chase
Floyd E. Williamson

DETROIT OFFICE
J. Edward Schipper

WASHINGTON OFFICE
816 Fifteenth St., N. W.

BRANCH OFFICES
Chicago—Mallers Bldg., 59 East Madison St., Phone Randolph 6960
Detroit—317 Fort Street, West, Phone Main 1351
Cleveland—538-540 Guardian Bldg. Phone Main 6432
Philadelphia—1420-1422 Widener Bldg., Phone Locust 5189
Boston—185 Devonshire Street, Phone Congress 4336
Indianapolis—1212 Merchants Bank Bldg., Phone Circle 8426

Cable Address ..... Autoland, New York
Long Distance Telephone ..... Bryant 8760, New York

United States and Mexico ..... One Year, $3.00
Extra postage west of the Mississippi River on account of Zone Postage Law, 0.50
Canada ..... One Year, 5.00
Foreign Countries ..... One Year, 6.00

To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order or Register your letter.

Owned by United Publishers Corporation, Address 239 West 39th St., New York; H. M. Swetland, President; Charles G. Phillips, Vice-President; A. C. Pearson, Treasurer; Fritz J. Frank, Secretary.

Entered as second-class matter Jan. 2, 1903, at the post-office at New York, New York, under the Act of March 3, 1879.

Member of Associated Business Papers, Inc.

Member of the Audit Bureau of Circulations.

Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly) July, 1907.

Tariff Export Essentials

THE Automotive Division of the Bureau of Foreign and Domestic Commerce, under the direction of Gordon Lee, has in preparation a series of tariff studies which should prove of considerable value to automotive exporters. The plan is to compile an accurate record of the tariff features in each foreign country, a knowledge of which is essential to the American entering the market.

The industry should follow this work carefully. The survey of essentials, for example, will include such tariff information as: General level and character of tariff; preference; basis of dutiable weight; basis of ad valorem duties; method of duty payment; surcharges; internal taxes on imports; consular and customs regulations; regulations regarding commercial travelers; advertising rules, and trade-mark protection requirements.

This will be kept up to date and the department is to arrange that manufacturers can obtain immediate and accurate information concerning the constantly changing current rates of duty upon specific commodities.

Every department of the manufacturer's organization may save considerable time and money by availing itself of the vast amount of information that is possessed by the Government.. Some of this data is not available in convenient form and much of it is simply "born to blush unseen." But an investigation of the various government bureaus will frequently reveal a surprisingly valuable lot of information that the manufacturer might spend considerable time and money to obtain independently.

Too Many Laws

SOMEBODY once said: "Of the making of books there is no end." This was true then and is true now. But the saying might be altered a little to read: "Of the making of *laws* there is no end," without sacrificing the truth at all.

Not only are there too many laws of national application, amplifying or modifying each other, but there are too many laws having a local application only. So that a man may do a thing in one part of the country for which he will find himself locked up in another part of the country.

The motor truck industry—and particularly passenger transportation lines and freight transportation lines over the highways—seem to have been singled out for more than their share of these laws. For example, taxation on trucks and buses of various capacities varies so greatly in the different States that it would be difficult to find two States in which trucks of different capacities are similarly taxed. Moreover, regulations as to the weight of the vehicles, the weight of the loads, the weight per inch of tire width and the percentage of weight on the rear axle are almost innumerable in their variety and complexity.

Not only does this apply to the different States, but it applies in some cases to the different counties and cities within a single State.

A certain motor truck line operates over the highway between San Francisco and San Jose, Cal. In so operating, the line comes under the jurisdiction of three counties and twelve incorporated towns and cities. Each one of these political subdivisions has the power to tax or license the operator of a passenger or freight carrying line, and all of them do so.

For licenses alone, the line has to pay each of these divisions fees running from $7.50 up to $32. These fees average about $16.50. Altogether, they mean an expenditure of about $185 for licenses alone, whereas, if the trucks ran just as often and just as long in a single county, the owner would have a maximum of $32 to pay in license fees, per truck.

But to this figure of $185 must be added the State motor vehicle license, averaging about $30 per year per truck and a personal property tax on assessed valuation of from $200 to $2,000 on various truck units, according to age and size. In the case of this particular line, also, each road truck making a daily call in these communities is liable to a tax (as distinct from the license fees) amounting to about $285 per year

which, based upon an assessed valuation of $2,000, would mean 14½ per cent per year.

Now this tremendous increase in taxation and license fees for operating over long distances instead of operating just as many miles back and forth in the same territory is most unfair.

To assail the operator of trucks who is increasing transportation efficiency is not only unfair and unreasonable, it is exceedingly short-sighted and unprogressive. For the easier and more flexible transportation becomes, the more business and prosperity there will be for everybody.

Four Wheel Brakes

FOR the past decade the question of four-wheel braking has come up at intervals. Such brakes have been tried in this country a number of times and then abandoned temporarily only to spring up here and there on experimental or hand-made cars of small production possibility. In Europe, however, the development of the four-wheel system has gone on steadily and particularly in the cars made where the Alpine region provides a testing ground have they become more prominent.

In America a large per cent of automobiles are never called upon to negotiate a hill which can be called a mountain. Most of our cars operate in country which cannot be characterized by any other title than flat. We have had another influence at work, however, in the increased average speed of travel because of better roads. The braking problem has returned and is more acute than ever both because of this higher speed on the open road and because of the increased speed and congestion on the city streets. Scores of accidents daily testify to the inability of present brake design to cope with the skidding and stopping problems on slippery asphalt. The broken wheel bill of the automobile using public is tremendous.

Does the four wheel brake answer the problem? There is reason to believe that many makers of the higher-priced cars are inclined to think it does. We have had some interesting development in this field. On the other hand, some look to a higher development of the transmission brake and there is much to be said for it, when so designed as to eliminate excessive heating and chatter. The combined internal and external brakes on the rear wheels do not satisfy present-day needs in certain respects, in spite of the fact that under average conditions they are good. It will be interesting to watch brake development in this country during the next three years.

The Ultimate Motor Bus

IT has been the sentiment of engineers throughout the industry for some time that the ultimate motor bus is still to be developed. Minor changes in bus chassis have failed, in most cases, to provide an entirely satisfactory vehicle for bus service. The factors involved in the construction of the 100 per cent motor bus have not yet been thoroughly analyzed and laid out. It would be interesting to develop, on a theoretical basis, an outline of the ultimate motor bus. It would be worth while for a number of competent engineers to do this, each in accordance with his own ideas. A comparison of the results would be illuminating.

Taking the standpoint of the rider, for instance, what factors are most important in the motor bus—comfort, speed, cost. . . .? Dividing these major factors into their component parts, how could the features desirable from the public's viewpoint be co-ordinated with the exigencies of engineering design?

Then also the possibility of operating at a profit must be considered, and this factor is affected to a certain extent, at least, for the original design. In noting the comparatively conservative progress that has been made in this country along the lines of special bus chassis design, it is interesting to note the rumor that one prominent manufacturer has completed the design for a low-priced, specially designed motor bus which will combine comfort and low-cost features. It is expected that this bus will be in production in the near future. The design is such that there is no body frame, the body resting upon cross-members of the underslung chassis frame. There are other distinctive features which render this new job of special interest.

It is mentioned here, however, merely as an example of the work that is going on in some responsible quarters, which indicates the conviction that the market is open for the company which can produce the ultimate motor bus.

"Gone Are the Days"

THE days of the old-fashioned press agent and his product are gone so far as the automotive industry is concerned. The press agent story is finding itself less and less welcome, even in the columns of newspapers which print considerable publicity material in their automobile section. The real reason such stories have lost caste lies in the fact that most sales executives have come to recognize how ineffective they are. Their very flagrancy eliminates the possibility of belief on the part of any intelligent reader.

A few samples of the press agent story, however, still come out now and again to refresh our memories of the days when P. T. Barnum publicity was considered effective in making automobile sales. Such an incident occurred recently, when a long "news" story was sent out by one manufacturer containing statements that simply were not true. This company sent out as facts a series of purely imaginary incidents, and asked the papers to print them as facts. To say the least, this is not ethical or sound business practice.

1922 Statistical Number

THE demand for extra copies of the 1922 Statistical Number, to be published Feb. 16, has already assumed considerable proportions. Those desiring additional copies of the number should place their order at once.

Lincoln Sales Leap as Ford Buys

Reach High Record Under New Control

Executives of Two Plants Confer Relative to Co-ordination of Policies

DETROIT, Feb. 8—Sales of Lincoln cars in the two days since the company passed into the hands of Henry Ford have reached record-breaking proportions. Factory estimates place the total at upwards of $2,000,000, almost $500,000 of which came from New York City alone. All important sales centers are represented in the total.

While the factory force and equipment are being whipped into shape to meet this deluge of business, Henry and Edsel Ford are meeting daily with Henry M. and Wilfred C. Leland for conferences with executives of the two plants to work out a permanent plan under which the company will operate. Every phase of the Lincoln policy is being studied to determine how best the facilities of the Ford Motor Co. can be co-ordinated with them.

Take Up Sales Field Expansion

The expansion of sales territory to include points in which Lincoln is not now represented is one of the questions under consideration. It will be determined at the conferences whether Ford dealers at these points will be authorized to sell the Lincoln car through the present Lincoln distributor organization or direct from the factory. In this connection it is noted that sales for the past two days have been entirely by the old Lincoln sales force.

It is considered unlikely there will be any change in the present system of building the car in the Lincoln plant, although the facilities of the Ford assembly plants will figure largely in the servicing plan.

Executives of the purchasing, production and sales departments of the two plants are meeting with the Fords and Lelands in separate conferences which are practically continuous and take the participants on hurried trips from one factory to the other. It is asserted that no official statement will be forthcoming until the program for the future is definitely formulated.

Immediate Price Reductions

The first announcement made after Ford's bid of $8,000,000 for the Lincoln plant was accepted last Saturday by Federal Judge Tuttle, was of price reductions ranging from $700 to $1,200 on the various Lincoln models. The touring car was cut $1,000 to $3,300, which brings it within $150 of the seven passenger Cadillac, which sells for $3,150. The seven passenger Marmon touring car is priced at $3,700, the six passenger Mercer at $3,950, the six passenger Noma at $3,200, the seven passenger Premier at $3,250, the six passenger Stutz at $2,990 and the seven passenger Winton at $3,400.

Announcement of the fixing of the new Lincoln prices at a level higher than had been expected has had a stabilizing effect on companies in the higher price classes. It had been expected that an even more radical reduction would be made. A

(*Continued on page* 303)

NEW LINCOLN PRICES SHOW BIG REDUCTION

	Old Price	New Price
7 pass. Touring ...	$4,300	$3,300
5 pass. Phaeton ...	4,300	3,300
4 pass. Phaeton ...	4,600	3,800
Coupe	4,950	3,900
5 pass. Sedan	5,400	4,200
Town Car	6,000	4,800
7 pass. Sedan	6,000	4,900
7 pass. Limousine .	6,000	5,100
4 pass. Judkins sedan	5,900	5,200

Northway Back in Old Company as President

BOSTON, Feb. 7—Ralph E. Northway, who recently severed his official connection with the Northway Motors Corp., has returned to that company as president and general manager. His election followed the resignation of James F. Cavanagh as president and general manager and of James F. Finneran as secretary and treasurer. Cavanagh was elected chairman of the board of directors, a new office, and William W. Caswell was elected a director, secretary and treasurer.

Caswell is treasurer of the Arthur D. Little Co., Inc., of Cambridge and vice-president of the International Abrasive Co. He has a high financial standing in Boston.

Northway is the designer of the motor which bears his name and is regarded as one of the most valuable assets of the Northway Motors Corp. After he resigned his official connection with the company he became associated with other interests in the purchase of the Harley Co. from the Hendee Mfg. Co. It is assumed he will retain this interest.

Makers Satisfied with Chicago Show

Encouraging Record of Sales Made—Lessons Given Salesmen Prove Effective

CHICAGO, Feb. 4—The Chicago show has closed with a decidedly encouraging record of retail sales and with a placing of wholesale orders by visiting dealers which seems to be quite satisfactory to a majority of the manufacturers.

Attendance throughout the week was heavy, with mid-week evening crowds that established new records for the Chicago exposition. Buying was more generally spread around than at New York, probably because there was no such disturbing element as the wave of price reductions which accompanied the earlier show. The announcement of the Dodge Brothers reduction, which was smaller than the public had been expecting, seemed to exert a stabilizing influence which was not seriously affected by the mid-week reduction announcements applying to the Nash Four, Dort and National.

Both the manufacturers and the local and visiting dealers watched with interest the experiment inaugurated by the Chicago Automobile Trade Association in training salesmen in the show to tell a unified story about the industry. There were some deviations from the plan and some salesmen violated the rule against criticism of competing cars, but on the whole the men took up the idea enthusiastically and the solicitations in the exhibits were above the average.

There was keen competition among the salesmen to win the $50 daily prize offered for the best solicitations. Business men rather than trained investigators went the rounds as judges and reported much excellent work. One day it was necessary to make a selection out of fourteen names of men whose work was almost on an even basis, and every day decisions were hard to make.

WARFORD ASSISTING LEE

WASHINGTON, Feb. 6—L. E. Warford, formerly field representative of the American Automobile Association, has been assigned to the Automotive Division of the Bureau of Foreign and Domestic Commerce for the purpose of obtaining foreign data and other information of value to the automobile industry. He appears as a special agent of the National Automobile Chamber of Commerce and will assist Gordon Lee, chief of the division. Warford is a resident of Seattle.

Factory Schedules Reflect Optimism

Parts Makers' Business Shows Improvement—Truck Outlook Is Distinctly Encouraging

By James Dalton

NEW YORK, Feb. 7.—Tentative production schedules in the Detroit district for February reflect the confidence inspired in manufacturers by the interest in motor cars displayed by the public at the New York, Chicago and other shows held thus far. This increased activity has resulted in better business for the parts makers.

The industry as a whole believes the corner has been definitely turned and that improvement from now on will be continuous although slow. Prices seem to have slipped somewhat into the background, and the prospect of cut-throat competition is not as menacing as it was a month ago, when so much emphasis was placed on price at the New York show.

Prices Being Stabilized

Reductions made by Dodge Brothers, which were viewed with alarm by many companies when the "mystery announcement" was first made, now are expected to exert a stabilizing influence. The cut was only about half what was generally expected, and is another indication that few more concessions can be expected in the lower price classes until production costs can be scaled down again. There is little present prospect of a further lowering of costs. In fact, the Franklin company has increased by $100 the prices on three of its models.

The most unsettling factor in the higher price field is what Henry Ford will do with the Lincoln Motor Co. As soon as he gained control price reductions running up to $1,200 were announced. An effort is being made to determine how many cars can be absorbed this year with a view to establishing a manufacturing schedule on this basis. It is expected that many Ford dealers will handle the Lincoln.

Truck Conditions Different

Conditions in the truck field are somewhat different because price adjustments have not been so general in that branch of the industry. When it was accepted that there was no demand for trucks and therefore no business to be had, there was no particular incentive to revise prices, but now that the market is showing signs of life there are indications that the course of events in the passenger car field will be duplicated. Several reductions have been made recently and several more are in prospect.

The outlook for trucks is distinctly encouraging. Most of the manufacturers have got down to the bottom of their inventories and are giving releases on materials which have been held up for months. A really good farm market is in prospect within a few months when cash becomes a little more plentiful in the agricultural districts. Farmers are buying even now on a small scale in some sections. Expansion on the co-operative marketing movement inevitably will involve the use of thousands of motor vehicles.

A feeling of greater confidence now pervades all branches of the industry. The year is expected to be one of readjustment, but it is felt that it will be one of progress and stabilization.

NEW PARTS BUSINESS IS BEST IN MONTHS

NEW YORK, Feb. 3—The volume of new business received in the past two weeks by parts makers has been larger than at any time for several months. Not only are substantial orders actually being placed but the large number of inquiries received indicate that a larger business is in prospect for the near future.

Large orders for supplies are being placed by the Gray Motor Corp. and by the Rickenbacker Motor Co. It is understood Gray is buying on the basis of 20,000 cars.

In consequence of the sales which the last fortnight has brought the parts makers are more optimistic than they have been for some time, although they have no expectation of doing anything like a capacity business this year.

Fenn Advises on Proposed Truck Laws in Canada

NEW YORK, Feb. 8.—F. W. Fenn, secretary of the motor truck committee of the National Automobile Chamber of Commerce, left Monday night for Montreal, where he conferred yesterday and to-day with the automobile interests of the province in regard to legislation which has been proposed to restrict the use of trucks of more than 3½ tons capacity. Fenn's advice on this subject was asked because of the limited experience Canada has had. Conferences were arranged for him with the heads of large transportation companies, dealers and the Government automobile bureau.

Fenn will deliver addresses to the students of Toronto University to-morrow and Friday on the subject of highway transportation.

White Inaugurates New Bonus System

Jobs Divided According to Skill of Employees, 10 Classifications Resulting

CLEVELAND, Feb. 6.—The White Co. has put into effect a new bonus plan for employees for the purpose of reducing turnover of labor and increasing labor efficiency. The bonus is in addition to all hourly wages paid, is independent of the regular compensation paid and it is not to be confused with the piece work system.

In the plan quality of workmanship is of prime importance, for only good pieces that pass rigid inspection qualify the worker to earn a bonus.

Under the system all jobs in the factory are classified according to the skill required of the worker. Each job is placed in one of ten bonus classifications. Classification charts and standard jobs are in the hands of the superintendents and are posted in the factory so that the workers may ascertain what job and bonus class cover his work.

Standard Table Adopted

A standard table of fatigue and rest allowances, classified according to the job, has been adopted in addition to the standard job and bonus class. From 10 per cent to 22 per cent allowances are made for fatigue and rest, most of which are granted on jobs that put the greatest strain on the worker.

After the job has been studied and classified a bonus chart and instruction card is filled out and given to the worker. This card outlines the method by which the work should be done, giving equipment, set-up, total time for each part of the operation, total net time, time allowance for fatigue and the standard time for doing the job.

In order to arrive at the standard job and bonus classifications, time studies were made by the men who formerly had been practical workmen and foremen and who have from three to five years study experience. Studies were made of each job at least three times so that the chance for error was reduced to a minimum.

Bonus Begins at 60 Per Cent

The bonus chart is set on the standard time of the instruction card for 100 per cent efficiency, but a man begins to earn the bonus when he reaches 60 per cent of the standard and the bonus chart also shows the amount of money which may be earned by increasing the output.

As long as the operation is performed in accordance with the instructions, equipment, method, etc., outlined on the bonus chart and instruction board the bonus will not be lowered nor will the standard classifications, together with the rest and fatigue allowances be altered.

(*Continued on page* 302)

International Cuts Prices on Tractors

Says Ford Forced It — Reduces Lists of 10-20 Titan Models $200 and 8-16, $230

CHICAGO, Feb. 4—The International Harvester Co. claiming it was forced into a price war on tractors by the $230 reduction on the Fordson has made almost an equal reduction on its two models of Titan. The 10-20 has been reduced from $900 to $700 and the 8-16 from $900 to $670. The new prices include a one or two bottom P & O plow or a tractor disk harrow. This offer holds good until May 1. In the equipment on the Titan is included friction clutch pulley, fenders, platform, throttle, governor, adjustable draw bar angle lugs and brakes. This equipment is valued at $100.

In a statement given out to the public the International Harvester Co. says:

The International Harvester Co. has announced price reductions of $230 on two-plow tractors and $200 on the three-plow tractors, effective immediately.

Until May 1 next, the company will present to every farmer purchasing one of these tractors a two-furrow or three-furrow plow or a tractor disk harrow.

President Harold F. McCormick said:

This reduction is not justified by any present or prospective reduction of manufacturing costs. It is made chiefly to meet competition and to enable our dealers to maintain their position in the trade. The burden of this reduction and the cost of the plows or harrows presented to purchasers will be borne entirely by the company.

Franklin Raises Price $100 on Three Models

SYRACUSE, Feb. 3—An increase of $100 in the prices of three of its models, effective Feb. 1, is announced by the Franklin Automobile Co. The price changes follow:

	New Price	Old Price
Touring car	$2,450	$2,350
Runabout	2,400	2,300
Sedan	3,450	3,350

All prices are f.o.b. Syracuse.

NATIONAL LOWERS PRICES

INDIANAPOLIS, Feb. 4.—The National Motor Car & Vehicle Co. has made reductions in price as follows:

	Old Price	New Price
7-pass. Touring	$2,990	$2,750
4-pass. Touring	2,990	2,750
3-pass. Touring	2,990	2,750
4-pass. Phaeton	3,500	3,250
7-pass. Phaeton	3,600	3,350
Coupe	4,140	3,890
Sedan	4,240	3,990

SAMSON REDUCES $220

JANESVILLE, WIS., Feb. 6—The Samson tractor division of the General Motors Corp. has reduced the price of its model M tractor from $660 to $445. The cut comes a week after the reduction made on the Fordson tractor. The new price is said to be the lowest ever quoted for a tractor of the size and capacity of the Samson.

DORT LISTS REVISED

FLINT, MICH., Feb. 4—The Dort Motor Car Co. has made price reductions, effective at once, as follows:

	Old Price	New Price
Touring	$985	$865
Roadster	985	865
Sedan	1,685	1,445
Coupe	1,535	1,315

Other Revisions on Page 301

Will Direct Foreign Trade of Rubber Association

NEW YORK, Feb. 6—Work of the foreign trade division of the Rubber Association of America will be carried on by a new executive committee headed by F. E. Titus, director of sales for the International B. F. Goodrich Corp. While no statement of detailed plans for the coming year has been made, the general policy of the foreign trade division will be continued. It is designed to promote trade intercourse between the United States and other countries by the dissemination of information regarding trade conditions abroad, credits and local methods of transacting business. One purpose is to make as intelligent and uniform as possible the methods of Americans engaged in foreign trade.

Titus is thoroughly familiar with the export field. He went with the Goodrich company in 1906 and became sales manager of the International corporation when it was organized. He also served as manager of the foreign trade division of the Akron Chamber of Commerce and as a trade advisor at the convention of the National Foreign Trade Council in Cleveland last year.

Caley Is Chosen to Head Show Managers Association

CHICAGO, Feb. 6—Fred H. Caley, secretary of the Cleveland Automobile Manufacturers and Dealers Association, was elected president of the National Association of Automobile Show and Association Managers at the annual meeting here. He succeeds E. E. Peake, secretary of the Kansas City Motor Car Dealers Association, who has been president since the organization was formed. Peake retired because of pressure of work in connection with his private interests.

Robert E. Lee, secretary of the St. Louis Automobile Dealers Association, was elected vice-president, and Neal G. Adair was re-elected secretary-treasurer. Headquarters will continue to be maintained at the office of the secretary-treasurer, 239 West 39th street, New York. The officers, with Price Wells, secretary of the Louisville Automobile Dealers Association, and W. H. Shuart, secretary of the Detroit Automobile Dealers Association, constitute the board of directors.

Bank Creditors Aid Locomobile Plans

Propose Buying Property at Sale —Other Interests Offered Opportunity to Join

NEW YORK, Feb. 6—While no announcement has been made of the plans contemplated for a reorganization of the Locomobile Co., it is understood the bank creditors propose to buy in the property at a receiver's sale and put in some new money, giving stockholders and merchandise creditors an opportunity to join with them. The receivership application filed at Bridgeport was proposed by the bank creditors, but there were no objections from the representatives of the merchandise creditors who have served on the creditors' committee which has had charge of the company's finances since it was separated from Hare's Motors.

Colonel Elmer H. Havens and Edwin A. Travis have been appointed ancillary receivers of the Locomobile Co. in New York by Federal Judge Mack. Their bond has been fixed at $100,000.

The assets of the corporation are estimated at $4,750,000, exclusive of real estate upon which no valuation is placed in the papers. The assets consist of $1,000,000 in cash on hand and in banks; $1,000,000 in plant and equipment; $1,000,000 in raw materials; $800,000 in manufactured cars; $500,000 in parts and accessories; $200,000 in used cars and trucks; $140,000 in trucks; $60,000 in bodies and $50,000 in investments.

No estimate of the liabilities was contained in the papers filed in this jurisdiction, but the original receivership application placed them at $5,000,000.

Will Protect Assets

PHILADELPHIA, Feb. 9—Federal Judge Dickinson has appointed Elmer H. Havens and William S. Horner ancillary receivers for the Locomobile Co. to take charge of the assets in this city pending the proposed reorganization of the company. Homer is general manager of the Philadelphia company.

Oshkosh Tractor Abandons Plan to Absorb La Crosse

MILWAUKEE, Feb. 6—Inability to finance adequately the enterprise has resulted in the abandonment by promoters of the Oshkosh (Wis.) Tractor Co., a Wisconsin corporation with $1,200,000 capital, of the plan to take over the business of the LaCrosse (Wis.) Tractor Co. and erect a new factory in Oshkosh. Foundations for the plant were laid last fall, an investment of $200,000 being contemplated. The new Oshkosh concern had actually taken over the plant, equipment and business of the LaCrosse company, but the contract has now been abrogated by mutual agreement, and liquidation of the Oshkosh business is under way. The liabilities are only $10,000 to $12,000 and are amply covered.

Dunlop Tire Defers American Operation

Company Will Not Seek 1922 Business—Conditions in International Market Blamed

BUFFALO, Feb. 7—Hope for early activity at the big plant of the Dunlop Tire & Rubber Corp. is again deferred by a statement issued with the sanction of Parry D. Saylor, vice-president. Regarding rumors of changes in organization here and of immediate resumption of operations, Saylor said that the whole subject was covered in the statement which reads as follows:

"Prevailing conditions in the international rubber market have prompted the Dunlop Tire & Rubber Corp. to postpone the resumption of activity at its American plant on River Road.

"It has been hoped that operations would get under way during the present winter and spring, but the directors of the company have decided, after a careful survey of conditions, not to seek 1922 business. The construction and equipment work necessary to put the plant into a production sufficient to operate on a profitable basis could not be accomplished before the best of the season's business had already passed.

"Further developments are, therefore, postponed until such date as will permit the company to take such advantages as an early start for 1923 may provide."

It was stated yesterday at the plant that members of the present staff may be called to England for service in the parent company during the interim. Certain of the engineering and factory force will be retained in Buffalo in order to protect the plant and keep all the machinery and equipment in good order.

Dunlop's international organization is now in much better shape. All inventory losses have been written off by the English company, and business for the present fiscal year is in very satisfactory shape.

Seaman Chosen Treasurer of Milwaukee Employers

MILWAUKEE, Feb. 6—H. H. Seaman, president of the Seaman Body Corp., and the W. S. Seaman Co., manufacturing passenger car bodies and specializing in closed types, was elected treasurer of the Milwaukee Employers' Council at the annual meeting. Herman A. Wagner, president Wisconsin Bridge & Iron Co., was elected president; Richard P. Tell, president National Brake & Electric Co., vice-president, and Joseph McC. Bell, secretary and manager.

The council was organized in the fall of 1920 and now has a membership of thirty-one of the major industrial groups in Milwaukee and suburbs. The council did not begin to function until the early part of 1921 and already has become an important factor in industrial relations here. Among the principal groups embraced by the membership is the Automotive Manufacturers' Association, Metal Trades and Founders' Association, Vehicle Manufacturers' Association, Brass Founders and Finishers Division, Sheet Metal Manufacturers Association, etc.

The aims and purposes of the Employers' Council as enunciated in its "Declaration of Principles," are:

1. To promote on a fair and equitable basis, industrial peace and prosperity in the community, and the steady employment of labor.
2. To provide proper safeguards for the health and safety of the employees.
3. To secure for employer and employee alike freedom of contract in the manner of employment.
4. To discourage strikes, lockouts, and unfair demands by either employer or employee.
5. To uphold the principle of the Open Shop.

Two New Chassis for Bus Service Built by Selden

ROCHESTER, N. Y., Feb. 4—The Selden Truck Corp. has brought out two new chassis known as Units 31 and 51, especially designed and constructed for bus transportation service.

The unit 31, rated at 2½-tons, has a wheelbase of 147 in. and a Continental engine 4⅛ x 5¼ in. It can be geared to make either 18 or 25 m.p.h. It has a seating capacity of 18 and a similar standing capacity.

The unit 51 is rated at 3½-tons, has a 177 in. wheelbase and carries 60 passengers, including seated and standing. The engine is a Continental 4½ x 5½. Either 18 or 25 m.p.h. may be had.

Reliance Truck Brings Out New Design of Snow Plow

APPLETON, WIS., Feb. 6—The Reliance Motor Truck Co., manufacturers of Reliance motor trucks, is bringing out a new design of rotary snow plow designed especially for clearing highways. A drum, 8ft. diameter, contains an auger, the whole being mounted on runners and attached to the front axle of a motor truck. Motive power to turn the auger at 400 r.p.m. is derived from the truck power plant. The device also is adapted for attachment to tractors.

Patents have been applied for. Initial models are under experimentation on dirt and concrete roads near Appleton under supervision of the county and state highway authorities.

WILMER BACK FROM BRAZIL

NEW YORK, Feb. 6—Gradual improvement in business conditions in Brazil was found by E. G. Wilmer, president of the Goodyear Tire & Rubber Co., who has returned from a trip to that country. Sales of his own company in Brazil are better than ever, he declared. Wilmer believes the curve of tire business in this country is still headed upward and that the "manufacturer who can keep his costs down and his quality up, may hope for satisfactory business during the coming year."

Moral Hazard Idea Seen in New Plan

Underwriter Divides Policy Holders Into Six Classes to Decide Most Unfavorable

NEW YORK, Feb. 6—One of the largest automobile underwriting companies has decided to divide its automobile policy holders into six classes this year in order to decide just what class of policy holder yields the most unfavorable experience. This plan is a practical application of the contention of the insurance committee of the National Automobile Chamber of Commerce that the moral hazard should be given greater consideration by insurance companies.

The announcement of the company in reference to the classes into which it has divided its policy holders follows:

1—High grade business men with incomes of $5,000 a year or more. Into this class will be placed only substantial, solid business men who are connected with growing concerns and not experimentors or speculators.

2—Laborers, mechanics, and workers of various kinds with an annual income of about $2,500. We will place in this class principally union labor.

3—Those using their cars in their daily work, i.e. doctors, salesmen, etc.

4—Farmers, and ranchers, and dairymen, etc.

5—The young, unmarried men, clerks, and all who have not yet arrived, so far as a permanent business connection is concerned.

6—The undesirables that we are forced to write for one reason or another. All risks that we feel from the start are not good will be placed in this class.

Pierce-Arrow Arranges Loan to Pay Claims

NEW YORK, Feb. 3—It is understood in banking circles here that an arrangement has been made by the Pierce-Arrow Motor Car Co. by which it has obtained $1,000,000 in cash, which will be used to pay all merchandise creditors. These claims, it is stated, will be liquidated within the next two weeks.

Not all the cash will be required for this purpose, and a considerable sum will be left in the hands of the bankers to be drawn upon as required. The business of the company, especially in its truck department, is more satisfactory than it has been for a long time. Orders for a considerable number of trucks now are on the books and more are being received.

MID-WEST RUBBER ELECTS

CHICAGO, Feb. 6—At the regular monthly meeting of the Mid-West Rubber Manufacturers Association officers were elected for the coming year as follows: President, W. W. Wuchter, Nebraska Tire & Rubber Co., Omaha; first vice-president, Thomas Fallen, Lion Tire & Rubber Co., Lafayette, Ind.; second vice-president and treasurer, Samuel J. Turner, Brunswick-Balke-Collender Co.; secretary, C. S. Sutherland.

Value of Tellurium Just "Discovered"

Anti-Knock Compound Hailed by Press as Revolutionary Fuel

NEW YORK, Feb. 7 — Considerable excitement was caused in speculative circles last week by a United Press dispatch from Dayton which said that "discovery of a tellurium gasoline compound which increases automobile mileage 100 per cent over the present gasoline fuel was announced at the research laboratories of the General Motors Co." It was stated that the discovery was made by Thomas Midgley, Jr., and Thomas A. Boyd. As a result of this report, General Motors common stock went up a point or more.

The only trouble with the dispatch was that it was not given out at the General Motors research laboratories, and tellurium is not designed to be a substitute for gasoline.

Midgley and Boyd have been working for many months on the theory that fuel mileage could be materially expanded by redesigning internal combustion engines so that the compression would be increased provided some element were added to the fuel which would take out the cylinder knocks.

There are several anti-knock materials of which di-ethyl telluride is one of the most effective. According to Midgley, road tests have demonstrated that by increasing compression and using diethyl telluride an increase of from 80 per cent to 125 per cent in mileage can be obtained. This subject was discussed at the semi-annual meeting of the Society of Automotive Engineers last spring in connection with a paper by Fred C. Ziesenheim on "Developing the High Compression Automotive Engine."

The United Press dispatch naively added that the annual supply of tellurium was only about 60 tons while 1500 tons would be required to meet the annual consumption of gasoline.

Move to Put Tax on Gasoline Grows

NEW YORK, Feb. 6—Indications now are that several additional states will align themselves this year with the fifteen which already have imposed taxes on the sale of gasoline. The present tax is one cent a gallon in all states except Oregon, where it is two cents.

Legislation calling for a gasoline tax already has been taken up by eight more state legislatures. In some instances several bills have been presented covering the same general subject.

A bill which will be offered in Maryland by the administration will call for a gasoline tax to wipe out an old deficit resulting from highway construction. It will not be opposed by the motoring interests because it has been stipulated that this tax will be in lieu of all other automobile taxes. The danger is, however, that the present administration cannot bind later administrations to keep its promises.

Two bills have been presented in Mississippi. One calls for a state tax and the other would authorize counties to impose a tax together with a wheel tax. The state bill would impose a tax of one cent a gallon together with special taxes on distributors and dealers.

Two bills also have been presented in Virginia. One provides for a straight tax of one cent a gallon and the other for a tax of two cents a gallon with an impost of $25 on distributors and $5 on dealers.

Other states which propose an excise tax on gasoline are Massachusetts, Nebraska, New Jersey, New York, Rhode Island and South Carolina.

M. A. M. A. Headlight Group Names Cattell Chairman

NEW YORK, Feb. 7—The following officers have been elected by the headlight device group of the Motor and Accessory Manufacturers Association:

Chairman, J. H. Cattell, secretary-treasurer of the Warner-Patterson Co., Chicago; vice-chairman, Charles Franck, manager of the Holophane Glass Co. of New York; secretary, Frederick H. Ford, manager of the road lighter department of the C. A. Shaler Co., Waupum, Wis.; treasurer, Howard H. Parker, sales manager of the Macbeth-Evans Glass Co., Pittsburgh.

The next meeting of the group will be held at the Hollenden Hotel in Cleveland, April 4 and 5. One of the most important activities which the group is expected to take up is that of standardization.

Rubber Makers Oppose Egyptian Cotton Tariff

NEW YORK, Feb. 6—The legislative committee of the Rubber Association of America will be directed by the board of directors to present strong opposition to the proposal before the Senate finance committee to apply a higher tariff on Egyptian long staple cotton. The purpose presumably is to protect growers in the American Southwest.

Tire manufacturers, who are the principal consumers of Egyptian long staple cotton, do not believe the higher tariff would result in equalizing the price levels of the Egyptian and American product. They feel it is unsound from the standpoint of international trade to impose a high tariff when so little benefit would accrue to the domestic industry.

CHICAGO FRANKLIN LEADS

SYRACUSE, N. Y., Feb. 6.—The Franklin Motor Car Co. of Chicago led the list of Franklin dealers in 1921. Chicago jumped from third place in 1920 to first in 1921. The five Franklin dealers who took the largest number of cars during the past year were in their order: Chicago, New York, Boston, Los Angeles and Pittsburgh.

Lee Finds Better Conditions Exist

Government Official Reports Upward Trend in Industry—Met Dealers at Shows

WASHINGTON, Feb. 6—Analysis of the automotive industry in all of its branches by the Automotive Division, Bureau of Foreign and Domestic Commerce, shows that the industry has been on the upward trend during the last 30 days, due in some measure to price stabilization and the belief among manufacturers that the price war is ended.

Gordon Lee, Chief of the Division, returned today from the Chicago show and expressed the belief that the bottom had been reached in prices and that sales and production will increase steadily during the spring months, especially with renewed confidence on the part of dealers.

Lee contrasted the New York and Chicago shows by saying that the former was characterized by a frenzy of prices, while the Chicago show witnessed actual sales and revival of interest among dealers. Interviews with dealers convinced him that the dealer is becoming more discriminating in the selection of manufacturers. This is explained, he said, by the fact that many dealers have barely made living expenses and others have been forced to the wall during the past few years. Dealers now insist upon obtaining assurance of better terms in service and parts from companies financially sound.

It was found by Lee that many dealers from the South, the Southwest in particular, reported excellent prospects in their territories but had purposely held off purchases for a few weeks until they were convinced that prices had become stabilized. The Federal official believes that the domestic outlook is optimistic in every respect.

First Unit of Kelsey Plant Formally Opened

NEWARK, N. J., Feb. 7—The first unit of the new factory of the Kelsey Motor Co., which will manufacture the friction drive Kelsey car, was formally opened to-day. The building covers 32,000 sq. ft., with a large frontage on Washington Street. In the rear is a side track connecting with the Erie railroad. The siding is so arranged that supplies can be unloaded on the mezzanine factory floor where materials will be stored until needed.

Speakers at the opening exercises were Judge Robert Carey of Jersey City, President E. B. Slade and General Manager C. W. Kelsey of the motor company. There were a large number of guests who inspected the plant.

About 100 six-cylinder Kelsey cars are now in use and the company announces that it will add a four-cylinder line with a touring car selling at $985.

Wages in Industry Higher Than Average

Alexander Says Part Time Work Has Decreased Income of Automobile Employee

DETROIT, Feb. 7—Statistics covering the wages of workers in the automobile industry were presented by Magnus W. Alexander, managing director of the National Industrial Conference Board in an address here. Six important points were made by Alexander:

Automobile wages are higher than the average for industry in general.

Automobile wages were not increased as much over 1914 as were those of industry in general.

The average weekly income of the automobile worker has decreased rapidly because of prevalence of part time work.

Average hourly earnings in the automobile industry are double those of 1914.

Buying power of the average weekly automobile wage is as great as in 1914 in spite of present part time employment.

Buying Power High

Buying power of the average automobile wage is 25 per cent higher than in 1914.

"Whereas the average hourly earnings of wage earners in the automobile industry were 29.3 cents in July 1914, rose to 70.5 cents in September 1920, and then fell to 58.6 cents in June 1921, corresponding earnings for wage earners in all American manufacturing industry were 24.4 cents in July 1914, 62.4 cents in September 1920 and 52.1 cents in June 1921," Alexander said: "There were eighteen other principal industries which, during the last seven year period, showed a greater percentage net increase of hourly earnings than was shown in the automobile industry.

"In respect to weekly earnings, a slightly different picture is presented because of the influence of part time employment during the 1920-1921 period. Average weekly wages in the automobile manufacturing industry rose from $15.71 in July 1914, to $34.34 in July 1920, equal to 119 per cent increase, and then dropped to $25.40 in June 1921, resulting in a net increase of 62 per cent over the 1914 base line. Average hourly wages in all American manufacturing industry rose from $12.40 in July 1914 to $29.81, or by 140 per cent, in July 1920, and then dropped to $22.89 in June 1921, resulting in a net increase of 85 per cent over the 1914 base line."

Employment Decreased

He further stated:

The total employment in the automobile industry decreased 52.3 per cent from June 1920 to July 1921, and in all industry the decrease was only 37.1 per cent. In the automobile industry the volume of employment reached its low point at the beginning of 1921, followed by a marked revival up to May, 1921, and then by a considerable slump in June of that year.

A comparison of employment in the automobile industry with all American industry reflects the enormous growth of the former as compared with the average for the latter.

There is a relationship between the money wages earned and the prevailing cost of living which must be taken into account to secure an adequate measure of the wage purchasing power of the wage-earner or of his economic status at one time as compared with another time. After all, it is not so important to know how much anyone earns as to know how much he can buy in terms of necessaries and comforts of life with the money that he is earning. To ascertain the purchasing power of the money wage, or the real wage, it is therefore necessary to divide the money earnings by the cost of living; and the result will measure the economic status of the worker.

On this basis the automobile manufacturing industry shows that the hourly real earnings of the workers in June 1921, were 24 per cent higher than those in July 1914, while the real weekly earnings were at practically the same level.

For American manufacturing industry as a whole, the economic status of the average wage-earner had increased during the same period by 32 per cent for hourly earnings and by 14.3 per cent for weekly earnings. The results of this comparison check with the previously stated fact, that to begin with the actual money earnings of automobile workers in 1914 had been greater and had also increased to a lesser percentage during the following seven-year period than was the case with the general industrial workers.

Oakland Motor Car Co. of Canada Being Formed

OSHAWA, ONT., Feb. 8—The Oakland Motor Car Co. of Canada, subsidiary of General Motors of Canada, Ltd., is being organized. Operations will begin early in March and this will mean still more production for the Oshawa plants. Four body styles will be manufactured including a touring car, roadster, coupe and sedan. The car is slightly lighter in design than the McLaughlin-Buick six and somewhat lower in price.

The company already has large orders for the new Oakland six for export shipment. Officers of the new company are: President, R. S. McLaughlin; vice-president, G. W. McLaughlin; secretary, T. S. Merrill; treasurer, M. L. Prensky; assistant secretary, G. W. Hezzlewood. R. D. Kerby has been appointed temporary sales manager to perfect a sale and service organization. This work is in addition to his duties as sales manager of the Oldsmobile company.

NEW BENZ TRUCKS SHOWN

NEW YORK, Feb. 6—The latest models of the Benz-Gaggenau truck, just imported from the factory, are being shown by the Benz & Cie United States Distributors, Inc. The line comprises four chassis, ranging from 1-ton to 5-tons. The 4-ton and 5-ton models are chain driven and the others shaft driven. Bodies to suit any purpose are supplied. The company also makes double deck buses, fire apparatus and a tractor. The American agency will maintain a service station.

Truck Tone Better In New York Field

Indications Point to Large Users Preparing to Enter Market in Spring

NEW YORK, Feb. 7—The metropolitan truck market is developing a stronger tone, especially in the heavy duty class. In the past two weeks there have been repeated indications that fleet owners and large users of trucks are preparing to come into the market again this spring after a lull of more than two years.

The demand is not indicated so much at the present time by actual sales as by the apparent desire of prospects and former customers to consider spring installations.

This more favorable attitude is taken to indicate a strengthening of business confidence and holds the promise of translation into actual truck sales in March and April.

Truck Users Change Attitude

The changing attitude of truck users is one that has been closely observed by the metropolitan truck dealers. It is a matter of history now how the large truck users, with, in some cases, only half of their equipment in operation, closed the doors entirely against the addition of new equipment, and how this, together with the competition from reimported units, held the market stagnant for months.

There is another phase of the situation that lends a rosy tinge to the outlook. That is the fact that many of the heavy trucks in use in this territory to-day have been run to junk through the curtailing of replacements, and thus the used truck will not be the factor in its field that the used passenger car has been.

Up to the present time this upward trend has not made itself felt in the light delivery car class. The purchasers in this class to-day, as in the past year, have been principally the small business man who is just changing from horse-drawn to motor-driven equipment, small stores installing delivery service and similar businesses.

Passenger Car Sales Improve

Sales of motor cars in January were considerably better than the same month last year, and in most lines there is indication of a slowly increasing demand extending to the peak of the spring season.

Dealers in all price classes are pointing to the Ford and Dodge Brothers reductions as indications that the bottom has been reached and there are intimations that a few price increases may be announced in the near future.

The used car situation in the metropolitan district is assuming more promising aspects with most dealers in and about New York gradually reducing stocks.

Trade on Upgrade Throughout South

Cotton Belt Particularly Offers Opportunity to Companies Contemplating New Branches

NEW YORK, Feb. 6—An investigation of the automotive market made by AUTOMOTIVE INDUSTRIES in various sections of the middle south indicates that business will remain on the up-grade from now on. This seems to be particularly true in the cotton belt, because mills actually are short of cotton and the present price is likely to go even higher, which will add to the prosperity of the territory and also have an important psychological effect.

Good Time to Open Branches

It seems to be the general belief that any companies which contemplate opening southern branches would be wise to do so at this time in order to establish themselves on a solid footing and be ready for business when conditions improve.

Automobile sales for the last three months in the Atlanta district have been much better than in the three months preceding and were somewhat better than the same months of 1921. Accessory sales, however, remain about stationary, and most of the accessory dealers are rather heavily stocked. They are buying on a hand-to-mouth basis and have been for more than a year.

While no material improvement is expected in Atlanta district for the first half of 1922, all indications are that it will be better than in the same period of 1921. Conditions in other lines are steadily improving, and the second half of the year will be considerably better if there are no crop failures.

Dealers in the St. Louis district report that sales for the last three months have shown a marked improvement in passenger cars, trucks and used cars. By intensive selling methods accessory dealers have been able to bring their stocks down to a satisfactory basis, and few of them are overstocked. As a consequence they are buying liberally for future needs.

St. Louis Cheerful

In general, the feeling in the automotive trade in the St. Louis section is more cheerful than it has been for a year.

Many representative automobile dealers in the Louisville district did a volume of business in 1921 which equalled the record-breaking year of 1920. Profits were not quite so large, however, because of the lower list prices. Sales for the last three months have been much better than in the same period last year. Accessory dealers are not carrying over larger stocks, but are buying only to meet immediate needs.

It is expected that the first half of this year will bring a business equalling the first six months of 1921 in the Louisville territory, while the second half is expected to show a considerable increase over the previous year.

Sales for the last three months in North Carolina have been about on a par with the other two months of the year, but considerably less than 1921. Accessory dealers are carrying small stocks, but they show no disposition to buy liberally. Business for the next few months is expected to be slow, especially for cars selling for more than $1500. No other marked improvement is expected before the latter part of the year. The used car situation is unfavorable.

Sales in the Birmingham territory have fallen off a trifle in the last three months, but have been on about the same basis for a year. Accessory stocks are rather short, but dealers are buying only for their immediate needs. No great increase in business is expected for the first quarter, but sales are expected to increase in the second and third quarters, with a very slight falling off in the fourth quarter. It is believed that cars of southern manufacture will have a slight turn for the better as they are establishing better sales connections.

Business in Dallas Feels Effects of Price Reductions

DALLAS, Feb. 7—While complete reports have not been made, there are indications that the retail automobile business in Dallas and practically all north Texas for the first month of the year showed an increase over the closing month of the last year. From a dozen retailers in Dallas it was indicated the increase would be about 10 per cent. The retailers believe the reduction in prices had considerable to do with the increase in business.

Truck men declare their business was slightly increased and that the outlook is brighter. Tractor dealers reported increased business over the last month, but said their sales are still far from the volume during the banner months of 1920. They believe with the farmers ex-1920.

NEW TIRE WARRANTY APPROVED

NEW YORK, Feb. 6—The standard tire warranty and the accompanying revision of mileage adjustment practices recommended by the Rubber Association of America have been approved by 93 tire manufacturers. The list includes all the larger tire companies.

NO INCREASE IN LOAD WEIGHTS

NEW YORK, Feb. 9—Reports received by the traffic department of the National Automobile Chamber of Commerce indicates strongly that there will be no increase in the minimum car load weights on shipments of passenger cars and trucks to Pacific Coast points.

ACCEPT AMERICAN MOTORS BID

NEW YORK, Feb. 9—Creditors of the American Motors Corp. have agreed to accept an offer of $200,000 for the personal property of the company made by syndicates headed by C. B. Penney of Greenboro, N. C.

No Britain Market for American Parts

Prospects Vanish, Due to Import Duty, Trade Depression and Surplus Stocks

NEW YORK, Feb. 7—The market for American automobile accessories and component parts in Great Britain has practically vanished for the time being, according to a summary of the situation contained in a review of Anglo-American trade covering the outlook for 1922, published by the American Chamber of Commerce in London. In its discussion of the situation, these points are made:

For the time being the trade in American automobile accessories and component parts is dormant, and some time may elapse before it revives to any extent.

Likely to Retain Duty

The import duty of 33⅓ per cent is likely to be retained for two reasons—first, that it brings in revenue; and second, the British manufacturers favor its continuance.

In the opinion of those in touch with the British market, articles of special rather than general design seem to offer the best chances for American manufacturers, as there is less competition in the market for "specialties."

Other causes are the general trade depression and the large quantity of surplus stocks still unsold both in Great Britain and in the various dumps in France, and also in the hands of dealers, while another factor in the situation is the prejudice still existing in the minds of the British public against American component parts. This is, however, a diminishing factor, and some firms have overcome it to the extent of putting out a small car fitted with American back axles.

Yet another factor, the full effect of which has yet to be felt, is the vogue of the small car in Great Britain. American manufacturers build neither small cars nor parts of small cars, and consequently British manufacturers are likely to retain the advantage of this trade.

Transshipment Trade Affected

The trans-shipment trade of American parts and accessories, which used to be very profitable, has also been badly hit by the import duty. It is true that goods can be placed in a bonded warehouse immediately on arrival in Great Britain and re-exported therefrom, and so escape the import duty; but this is expensive, and it is doubtful whether any saving is made by this means.

Another disturbing element is the presence of large surplus stocks still to be absorbed. At Slough, the former government depot, there are reported to be large quantities of American accessories and component parts, as well as British, and in addition government stocks are reported in various parts of France as well as stocks in the hands of dealers.

Tax on Cars Yields Decreased Revenue

In Last Six Months of 1921 Reports Show Collections Fell Off $15,579,309

WASHINGTON, Feb. 7—Collections of excise taxes on automobiles for the last six months of the calendar year of 1921 decreased $15,579,309, as compared with revenues from this source during the same period of 1920. A slump of $1,584,735 was reported to the Bureau of Internal Revenue for December 1921, as compared with the same month of the preceding year. The total receipts from the manufacturers' excise tax on automobiles, motorcycles, accessories, etc., during the last six months of 1921, amounted to $57,308,245, as compared with $72,887,554 during the same period of 1920. The total receipts for the month of December 1921, on these products, amounted to $7,336,008, as against $8,922,744 in December 1920.

Truck Returns Less

A study of these tax returns shows that under section 900 of the Revenue Act of 1918, assessments on motor trucks and wagons for the last six months of 1921 amounted to $4,098,904, as compared with $7,494,029 for the same period in the preceding year, or a decrease of $3,395,125 in revenue from this source. The receipts from automobile trucks and wagon taxes during December 1921 amounted to $473,713, as against $663,594, or a decrease of $189,880. Segregated taxes collected on other automobiles and motorcycles from July 1 to December 31, 1921, amounted to $28,606,522, a decrease of $13,150,826. The returns for December 1921 on these items amounted to $3,999,136, as compared with $4,918,626 for the same period of 1920, representing a decrease of $919,489.

The figures for the latter part of 1921 show an increase in receipts from the sale of automobile accessories and parts, amounting to $966,642. The total revenue from this source amounted to $24,602,818, as against $23,636,176. As compared with December 1920, the taxes for December 1921 declined $475,365, as the yield for the month on automobile accessories and parts aggregated $2,863,158.

Directors Elect Hughson Head of Old Timers' Club

CHICAGO, Feb. 7—At the annual election of officers of the Old Timers' Club held here, the directorate nominated in New York during show week was chosen unanimously, and the directors thereupon chose William L. Hughson, president; F. Ed. Spooner, secretary, and J. Edward Schipper, treasurer.

The newly elected vice presidents who are also the directors consist of Captain E. V. Rickenbacker, vice president, Rickenbacker Motor Car Co.; E. C. Morse, director of sales and advertising, C. H. Wills & Co.; Harry Branstetter, Chicago distributor; Ralph Hamlin, distributor in Los Angeles; George T. Briggs, sales manager, Wheeler & Schebler; Harry W. Anderson, general sales manager, Duesenberg Motors Co.; Chester I. Campbell, manager, Boston automobile shows; Horace W. DeLisser, Ajax Tire & Rubber Co.; George W. Hanson, president, Hanson Motor Car Co.; Louis Block, president, Philadelphia Automobile Trade Association; E. E. Peake, secretary-treasurer, Kansas City Motor Car Dealers' Association.

The following directors hold over: Lloyd Maxwell, Thomas J. Hay, Walter Bermingham, Martin L. Pulcher, Richard Kennerdell, Albert Champion, Gregory Flynn and John Younger.

The club adopted a constitution and by laws which will be distributed to the membership.

Nash Four-Cylinder Line Cut in Price

NEW YORK, Feb. 8—Reductions have been made in the prices of the Nash 4-cylinder chassis and is priced at $1350.

Model	New Price	Old Price
Touring	$985	$1,045
Roadster	965	1,025
Coupe	1,485	1,645
Sedan	1,645	1,835
Cab	1,295	1,395

No change has been made in the prices of the 6-cylinder line. The line of trucks for 1922 will be continued with minor refinements, but the ratings have been changed slightly to conform to the requirements of new state license laws. The new cabriolet, which is a five-passenger enclosed car, is mounted on a four-cylinder chassis and is priced at $1350.

LOWER PRICE FOR WALLIS

RACINE, WIS., Feb. 8—The J. I. Case Plow Works has reduced the price of the Wallis tractor and the J. I. Case three-bottom plow to $995. This combination sold a year ago for $2,023.

MIDWEST UTILITOR REDUCED

INDIANAPOLIS, Feb. 8—The Midwest Engine Co. announces that the price of its model 501 walking type Utilitor has been reduced from $345 to $295, f.o.b. Indianapolis. The riding type of Utilitor has been reduced from $390 to $340.

OLYMPIA TRUCK LOWERED

TACOMA, WASH., Feb. 6—The Olympia Truck Co. has reduced the price of its truck, a 2½-ton model, from $3500 to $3200.

GARFORD MAKES REDUCTIONS

LIMA, OHIO, Feb. 9—The Garford Motor Truck Co. has reduced prices on its three largest models. The list follows:

	New Price	Old Price
3½-ton	$3,750	$4,300
5-ton	4,500	5,200
7½-ton	5,200	5,500

Proposed Bonus Tax Modified by Mellon

House Committee Also Does Not Favor 50-Cent Per Horsepower Levy

WASHINGTON, Feb. 7—Determination of the majority leaders in Congress and officials of the Administration to force bonus legislation brought the suggestions of Secretary of the Treasury Mellon for additional taxes on motor vehicles and gasoline to the fore this week. It is said that certain members of the House Committee on Ways and Means have given serious consideration to the proposal to raise the additional funds through an assessment on gasoline and tobacco. The suggestion to impose a tax of 50 cents per horsepower on owners of motor vehicles finds little active support in Congress, particularly at this time when the Congressional elections are approaching.

Secretary Mellon advised AUTOMOTIVE INDUSTRIES today that he did not recommend the assessments on automobiles, gasoline, etc., but submitted them as suggestions in compliance with the request of the Ways and Means Committee for additional sources of revenue necessary to meet payment of the proposed soldiers' bonus.

In testifying before the Committee, Secretary Mellon suggested a levy of 50 cents per horsepower, but later supplemented it with the proposal that 25 cents per horsepower would be more acceptable in event the Congress decided to enact a bonus bill. He believes that a storm of opposition might develop from a tax as high as 50 cents and might ultimately affect the sale of high-powered cars.

Hare Leaves Manufacturing Field for Merchandising

NEW YORK, Feb. 8—A new company known as E. S. Hare, Inc., has been organized to succeed Hares Motors, Inc. It is headed by Emlen S. Hare and most of his associates will be men who served in the old company. The most important change is in the election of H. B. Lewis, formerly in charge of the advertising, as vice-president to succeed Henry Lansdale The engineering department will be continued with H. D. Church as vice-president in charge of that branch of the business.

The new company will act as manufacturers agents, sales and engineering experts. It will retire altogether from the manufacturing field and devote all its energies to merchandising. The company now has charge of the sales of two truck manufacturing companies.

The identity of E. S. Hare, Inc. will not appear in any of its activities so far as the public is concerned. It is the purpose to take over the sales departments of the companies with which it makes contracts, designing of sales policies and taking over distribution.

Banks Would Keep Overland Control

Will Ask Preferred Stockholders' Consent to Mortgage—Result of Plan in Doubt

NEW YORK, Feb. 8—Bank creditors of the Willys-Overland Co., whose claims aggregate approximately $16,000,000, have virtually agreed upon a plan for funding the bank loans and providing new working capital. This plan, which must be ratified by holders of 75 per cent of the perferred stock, calls for a first mortgage bond issue of $25,000,000 of which about $18,000,000 would be issued.

This would cover the bank loans as well as commissions which would be charged by the bankers. In order to secure working capital, however, the company would be obliged to become a borrower again from the banks. The plan of the bank creditors in this respect provides for the creation of a revolving credit of several million dollars.

Stockholders' Consent Improbable

Whether or not the preferred stockholders will consent to this plan remains to be seen. In some quarters it is considered highly improbable that they will. In that event it is probable the banks will call the loans, which mature March 1. The inevitable result of such a course would be a receivership under which the banks would stand, in the eyes of the court, on an equal basis with all the other interests involved.

If the banks would consent to renew the notes when they come due it is understood the Willys-Overland Co. would be able to make another 10 per cent payment in addition to the 20 per cent which already has been made. After its reduction of the notes the company still would be able to get along without additional working capital. On the other hand, if the plan of the bankers is accepted by the stockholders, the banks would retain a firm grip on the company.

Common Stock Loses Vote

The preferred stock of the Willys-Overland Co., like that of all the other Willys companies, contains a provision that no mortgage or other obligation can be placed upon the property without the consent of the holders of 75 per cent of the stock. It also provides that voting rights in the company revert to the preferred stockholders if four quarterly dividends are passed. The voting rights, therefore, have been lost by the common stock. Under the bankers' financing plan control of the company would pass to a voting trust in which the bank interests would be well represented.

In connection with the present situation it is interesting to recall that when the Willys-Overland Co. acquired control of the Moline Plow Co. in 1918 by purchasing 82 per cent of the common stock from the Stephens interests, it gave in exchange preferred stock in three Willys companies. The proportions of this stock were: Willys-Overland 55 per cent, Electric Auto-Lite Corp. 30 per cent, Curtiss Aeroplane & Motor Co. 15 per cent.

The Moline Plow Co. authorized common stock is $21,000,000 and while the stock books are not available it is understood the Willys-Overland Co. now owns about $17,000,000 of its stock in exchange for which the Stephens family took approximately $9,000,000 in non-convertible cumulative preferred of Willys-Overland. The Willys-Overland preferred stock outstanding amounts to approximately $22,000,000. This would give the Stephens interests control of a little more than 25 per cent. The remainder of the Willys-Overland preferred is held in small lots.

No Changes in Administration

It remains to be seen how much personal interest John N. Willys has with the Stephens interests and whether they will accept the proposal of the bankers. In any event it can be stated there is no foundation for reports that important changes will be made in the administration of the company. Willys will continue as president, devoting much of his time to sales, while Walter P. Chrysler will continue in charge of operations as executive vice-president.

White Inaugurates New Bonus System

(*Continued from page* 295)

The White Company worked out the method on the theory it would pay the men according to their ability. The employee who earns a bonus knows each day just what bonus he earned the day before. The number of pieces he produced is inspected and counted daily, the time checked and the amount of bonus computed. Then a bonus pay slip is made out showing the amount of bonus earned and this slip is handed to the worker the day after that particular bonus is earned. The bonus pay envelope contains the total of all bonus pay slips received by an employee during the preceding pay period.

Quality of Gasoline Marked by Uniformity

WASHINGTON, Feb. 6—Marked uniformity in the average quality of gasoline manufactured for sale during the winter months has been found by the Bureau of Mines, in a semi-annual survey of motor gasoline. The inquiry extended from 1919 to 1921 and was conducted during the winter and summer seasons. It was found that gasoline sold in the summer seems to vary in quality.

A study by cities shows that the average distillation figures for gasolines sampled in New York revealed a slight increase in volatility. Those from Washington showed a decided increase and those from Pittsburgh a decrease when compared with corresponding samples from the same cities a year ago.

Tire and Rim Men to Discuss Valves

Efforts at Standardization on Disk Wheels Will Be Made at Cleveland Meeting

CLEVELAND, Feb. 4.—A meeting of the Tire and Rim Association has been called in the Leader News Bldg. here this week with invitations extended to the members of the Automotive Metal Wheel Association and others interested in this industry.

The subject up for discussion is that of outside inflation for pneumatic tires mounted on disk wheels. The Goodyear Tire and Rubber Co. has brought the matter up for consideration in a bulletin as follows:

"Owing to the increased popularity of the disk wheel, and the various kinds of wheels on the market, it is highly desirable to have the disk wheel manufacturers standardize on one type of valve.

"In order to provide means for inflating tires which are mounted on disk wheels, from the outside of the wheel the different wheel companies are changing the designs of their wheels somewhat.

"At the recent Automobile Show in New York, there were at least four makes of wheels, each providing a different means of inflating the tires.

Tire Inflation Varies

"1st—The ordinary valve stem, which had to be reached on the inside of the wheel.

2nd—The curved valve stem on the Forsythe wheel of the Maxwell, which brings the end of the stem to the outside of the wheel.

"3rd—The slotted disk to which was attached a Schrader extension, on the end of a standard valve.

4th—The dished disk, which allows the standard valve to protrude on the outside of the disk.

"Besides the above, the Dill Manufacturing Co. of Cleveland is making two different kinds of disk wheel valve extensions.

"Last of all, Dodge Brothers has recently designed a curved valve for use on its wheels which is larger than the one in use by the Maxwell.

"In our opinion the fourth named is the most desirable—and we recommend that all disk wheel manufacturers be urged to design their wheels accordingly.

"This will enable the tire manufacturers to carry in their branches only tubes equipped with standard valves, and the automobile manufacturer will not be required to carry tubes with special valves for use on disk wheels.

"The use of an extension should be avoided unless absolutely necessary.

"We trust that this matter will be given attention by the Tire and Rim Association, as their help is needed in order to bring about some standardization of disk wheel valves."

Lincoln Sales Jump Under Ford Regime

Executives of Two Plants Confer Relative to Co-ordination of Policies

(*Continued from page* 294)

statement issued in behalf of the Lincoln company says in reference to prices:

"These new prices are considerably less than are warranted by actual production costs. It is the conviction of Lincoln officials, however, that the expected increase in volume of sales, assisted by Ford's tremendous purchasing power, which will be realized later on, will justify the sacrifice of immediate profits. As the new prices are based upon anticipated rather than upon actual existing advantages, it is asserted that the new prices must necessarily remain for a long time to come."

Prices May Be Scaled Gradually

On the face of it, the statement would seem to set at rest the fear that further price cuts would be made, at least for several months to come. It is the general belief within the industry, however, that the price of the Lincoln car will be scaled down gradually as output increases and production costs are lowered.

There is much speculation here concerning possible changes contemplated by Ford in the management of the Lincoln plant, although the statement made after the sale stated that the management would continue in charge of the Lelands.

The statement issued by the Lelands said in part:

This is believed to be the beginning of what is expected to result in one of the most far-reaching affiliations in the motor car industry; on one end the tremendous Ford institutions turning out a million or more motor vehicles a year, and on the other end the Leland-built Lincoln, which in a comparatively short time has forged its way to the front as probably the finest constructed car the world has ever seen.

Limitless Resources Furnished

It brings to the Lincoln Company Ford's almost limitless resources, and lack of finances was the only handicap the Lincoln Motor Company had ever experienced. It also brings together two men who are recognized as unquestioned leaders in their respective fields, Ford as the master manufacturer in quantity production, and Henry M. Leland as the master of the finest things mechanical.

While the new Lincoln Company becomes affiliated with the Ford Motor Company, the executive personnel of the two concerns will be held separate and distinct, the management of the Lincoln Company continuing with Henry M. and Wilfred C. Leland; in fact, this was one of the conditions insisted on by Mr. Ford at the outset of the negotiations.

An increased manufacturing schedule will be inaugurated immediately there being a large amount of stock in various stages of completion and much which is finished and ready for assembling. The former Lincoln manufacturing organization has largely been held intact and preparations were all made in advance so that everything would be in readiness to go forward as soon as the necessary formalities had been completed.

It is apparent that many persons have been misled into the idea that the Ford connection indicates a revolution in policies, particularly as those policies concern manufacturing practices and selling prices; but it is contended that anyone at all familiar with fine car construction knows the absurdity of any sweeping reduction in prices for a car of the Lincoln's character.

No Changes in Manufacturing

Both Mr. Leland and Mr. Ford have emphasized in the strongest possible terms that any thought of change in the Leland manufacturing standards would be utterly out of all reason.

Another point which is emphasized by the officials is that the company will continue its policy of not having so-called yearly models. This policy, it is claimed, insures the car purchaser against undue depreciation in the re-sale value of his car. It is also asserted that inasmuch as the present eminently fine mechanism of the Lincoln car was thoroughly developed before it was marketed at all, there is nothing in the line of changes under consideration.

The essentials of the merchandising policy, it is said, are also to be continued as before. The Lincoln Company has prided itself upon the exceptional character of its distributors; however the scope of the distributors will be enlarged by the appointment of dealers in the smaller cities.

It is the not uncommon opinion expressed in Detroit that the Leland-Ford affiliation was in no small way encouraged by Edsel Ford who is in full accord with his father's view as to the necessity of saving the Lincoln Company for the good of Detroit, for the good of the industry, and for the benefit of Motordom as a whole. It has also been evidenced for a long time that the younger Ford has a soft spot in his heart for fine cars, that he has held a strong desire to become identified with their manufacture, and that the Lincoln situation provides just such an opportunity. As Mr. Ford himself expressed it, it is a case of extremes meeting—the best low priced car, and the finest car in motordom.

Leland's Position Undefined

Operations were resumed Monday with a factory force of 600 men. Work was started under the same manufacturing and distribution policies as maintained before the receivership.

Where production methods can be improved without sacrifice of quality, changes will be made, W. C. Leland said, but these will be carefully determined. Reports that specialized production men would be introduced into the personnel were denied by him. The probabilities are that Ford engineers will work with the Lelands in an advisory way in determining changes.

No declaration was made as to the position of the Lelands in the new company, aside from their executive positions. It is expected that when the articles of incorporation of the new company are filed, they will be found to hold a considerable share in the stock of the new company, with the control vested in the Ford family.

(*Continued on page* 304)

Minneapolis Shows New Buying Spirit

Dealers Given Object Lesson at Exposition—Conditions in Twin Cities Improve

MINNEAPOLIS, Feb. 8—For a territory in which some distributors have almost no dealers left, that is, dealers who have cars in stock or even demonstrators, while other distributors have only about half their dealer organizations of a year ago, Minneapolis is holding a remarkable show. The crowds are on hand and they are buying a little, which indicates brightening prospects in the city and immediate vicinity, but the real accomplishment of the week is the object lesson to hundreds of dealers in name only, some of whom have not sold a car in a year, that people are still enough interested in automobiles to pay to see them and to buy them.

The distributors and branch managers have had pretty sizable dealer meetings, with attendances running half what they did two or three years ago, but this is something when it is realized that the territory, roughly speaking, runs all the way to the Rocky Mountains, and some dealers have traveled all night or a day and a night to get here.

Dealer Interest Increases

These dealers are not ordering cars by the carload, but some who have been nothing but garagemen for a year and a half are arranging to get a demonstrator, and in some cases an extra car or two to show. This, with the stimulus of the show and the week's meetings, indicates that there will be some lightening of the burden carried in 1921 by the distributors, some of whose businesses have been reversed from a normal of 75 per cent wholesale to 75 per cent retail. The distributors are planning to proceed as they did last year, getting into the territory with their travelers and helping dealers sell.

Local conditions, both in Minneapolis and St. Paul, are improving slowly, with decided gains in retail mercantile business in December and January. The great grain territory, covering six states, is still paying off debts which will be partly liquidated by the 1922 harvest, if it is a good one, and fairly well cleared away in 1923. This prospect, remote as it is, is creating some sales possibilities in the territory, but, though 70 per cent of the farmers have money to spend, they are not spending it with any freedom.

PULLMAN PACKARD OUTPUT

CHICAGO, Feb. 6—Starting March 1 the Pullman Co. will begin a schedule of 600 Packard automobile bodies a month. The company has maintained a Packard department for some time, but its operation has been sluggish for several months.

Lincoln Sales Jump Under Ford Regime

Executives of Two Plants Confer Relative to Co-ordination of Policies

(*Continued from page* 303)

Under the court order accepting the Ford bid of $8,000,000 for the property, the title will be turned over within 10 days, in which time the purchase is to be consummated. The gross liabilities of the company under the financial statement filed by the receiver as of Nov. 8 are $9,073,105.46. With preferred claims disposed of, this will permit a payment to creditors and noteholders of approximately 80 cents on the dollar.

Federal Tax Not Included

The financial statement did not include in the liabilities the $610,000 additional tax demanded by the government, the original filing of a $4,500,000 claim for which was the definite cause of the application for receivership. The tax, with state and local taxes and the $1,882,000 first mortgage bonds, constitute the bulk of the preferred claims against the company. The accounts payable total $1,276,470.59 and the notes payable $4,930,476.79.

The sale of the plant Saturday was witnessed by a large crowd composed largely of employees of the company, but prominent in which were important distributors who came from distant points to witness the formal sale of the company. Henry Ford with Mrs. Ford did not appear until after the sale had been made, but Edsel Ford and the Lelands, with many executives of the two companies, were in attendance.

Only one bid was made, that of Harold H. Emmons, counsel for the Lincoln Motor Co., who represented the Ford interests. The two other men who qualified to bid by depositing $250,000 certified checks with the court shortly after the first official closing time had expired Friday, declined to enter any offers.

Creditors to Get Return

These two were Emanuel T. Berger, a Detroit attorney, and George B. Judson, a vice president of the Bank of Detroit, which is controlled by James Couzens, former treasurer of the Ford company. Both declined later to identify the principals in their bids. Berger said Friday he was acting for persons identified with the industry, but at the sale Saturday said his clients had reconsidered bidding against the Ford interests. It was the impression that the Judson bid was entered in the Ford behalf as a precautionary measure.

During the progress of the sale the Lelands stood directly behind the court officer presiding. Edsel Ford was in a window overlooking the proceedings, which were held on the front steps of the plant. It was all over in a few minutes, and the crowd overran the factory in its desire to congratulate the Lelands and Fords on their success. Notice was given to foremen at once to have former employees to the number of 600 ready for work Monday.

Among the first to extend congratulations were important creditors and distributors. On his arrival Henry Ford met the distributors individually and assured them of the continuance of existing relationships between the company and its sales group.

It is expected general creditors of the company will receive between 60 cents and 75 cents on the dollar, according to estimates based on the sale of the property for $8,000,000. The board of governors of the stock exchange has removed the class A stock from the exchange because the price paid for the property was not sufficient to meet liabilities of the company, and therefore no money would be forthcoming for distribution among the stockholders.

Dodge Production Up; Will Make Own Bodies

DETROIT, Feb. 9—Production at the Dodge plant, which has been running at 550 daily since announcement of its price cut, will be increased to 600 daily before March 1. Preparations are being made by the company to manufacture its own open bodies, and they will be brought out in June or July. Dies and equipment now are being installed in the body unit of the plant. The company previously has manufactured its closed bodies.

The Ford Highland Park plant is operating on a basis averaging four days a week. Some departments are running more and some less. Production in some of the plants manufacturing cars in the Dodge class has fallen off temporarily.

ROOT QUITS WESTCOTT

SPRINGFIELD, Feb. 9—At the close of the annual meeting of the Westcott Motor Car Co. yesterday, announcement was made that H. G. Root had resigned as general manager, effective March 1, to devote his entire time to the H. G. Root Co. and the Automotive Parts Co. He has been general manager of the Westcott Co. since 1914. It also was announced that the Westcott plant would be operated at capacity for several months as a result of business now in sight. Officers elected by the company are: president, B. N. Westcott, vice-president, E. H. Gilcrest; secretary and treasurer, J. N. Reag.

MARKETING BILL PASSES

WASHINGTON, Feb. 9—The Senate yesterday passed the co-operative marketing bill, which authorizes farmers, ranchers, dairymen, planters, nut and fruit growers to act together in associations for collectively preparing, handling and marketing in interstate and foreign commerce the products of their farms, groves and ranches. Enactment of legislation authorizing co-operative marketing will result in greatly extended use of the motor truck by farmers.

Battery Servicing Abroad Emphasized

Government Agent Stresses Need for Carrying Full Stocks of Electrical Parts

WASHINGTON, Feb. 9—The demand for battery equipment service in South Africa has resulted in the organization of a company with service stations in Johannesburg, Capetown and Durban. In a letter received in the automotive division of the Bureau of Foreign and Domestic Commerce, a representative of the company discusses existing conditions in the electrical equipment trade in South Africa, pointing out that service facilities are essential to the continued satisfactory operation of a car with battery ignition, and adding that as American cars are the leaders in battery equipment too great emphasis cannot be placed upon the vital importance of proper servicing if they are to continue to hold their present position in foreign markets.

Some facts in the latter referred to are given below:

The few battery service stations in South Africa to-day are asked to repair any kind of trouble in battery ignition, lighting and starting equipment on any make of car. Service stations, therefore, must frequently call upon representatives of the automobile manufacturers to furnish parts for the specific makes of cars which they represent. Often, however, they do not carry adequate stocks of spare electrical equipment parts, as the turnover is small, and accordingly they represent a comparatively dead investment. In such cases, parts must be imported from abroad, which of course results in a delay of one or two months, thereby greatly inconveniencing the car owners. In order to expedite repairs, service stations should carry a complete line of electrical equipment parts for all makes of cars.

Much Capital Necessary

Considerable tying up of capital is involved in representing an American manufacturer in South Africa. In making agency arrangements, manufacturers should bear in mind the length of time goods are in transit to South Africa, the relatively slow turnover, the large stocks required owing to the distance from the factory, and the fact that very little business in South Africa is done on a cash basis. The consideration of these facts should lead manufacturers to realize the importance of granting liberal credit terms to overseas representatives.

If manufacturers will use care in choosing dealers of good repute and satisfactory credit standing, they will be able to deal direct with their representatives. In this manner the payment of special charges to buyers, shipping and commercial houses and bankers would be avoided, thus making possible price reductions to meet competition from foreign competitors.

MEN OF THE INDUSTRY

George H. Mueller, who during the war served as managing engineer of the Curtiss Aeroplane & Motor Corp., Buffalo, has become associated with the Pawling & Harnischfeger Co., Milwaukee, manufacturer of electric traveling cranes, machine tools, excavating machinery, etc., as general sales manager. He was connected formerly with the Link Belt Co. and the Jeffery Mfg. Co., and following the end of the war with the J. I. Case Plow Works Co., Racine, Wis. More recently he served as receiver of a defunct gas engine and machinery concern at Oshkosh, Wis.

Arthur X. Merz, secretary, Madison-Kipp Co., Madison, Wis., manufacturer of automatic lubricating devices, oil cups, etc., left Feb. 4 from New York on the Empress of Scotland for an extended business and recreation tour. The principal objective is Moscow, where Merz will investigate conditions respecting the possibilities of tractor business, especially with regard to the growing tendency of European manufacturers to build farm power machines to offset lack of imports because of unfavorable exchange rates. Later he will tour the Mediterranean region.

Alfred Reeves, general manager of the National Automobile Chamber of Commerce, left Saturday night for Atlanta, where he addressed the dealers association at a meeting Monday. He spoke Tuesday night to the dealers at Jacksonville, and from there went on to Daytona, where he will spend a week. Upon his return trip he will stop off at Camden, S. C., for a conference with Colonel Charles Clifton, president of the N. A. C. C.

J. C. L. Krebs, a pioneer in the industry, has become associated with the organization of the Collier Motor Truck Co., manufacturer of Collier trucks at Bellevue, Ohio. In 1912 Krebs organized what is now the Clydesdale Motor Truck Co. of Clyde, Ohio, and directed its activities up to the time of his resignation to join the Collier organization. His connection with the company will not affect the existing personnel.

Cass G. Selden, until recently an executive of the Scripps-Booth Corp., has been named general manager of Joseph N. Smith Co., builder of automotive body hardware. Before joining Scripps-Booth Selden was connected with the Studebaker Corp. **George Rumford** has resigned as production manager at Maxwell to become production manager at the Smith company plant.

Pitt W. Danforth has become associated with Lewis, Murphy & Co. and will devote his time principally to the business service for the automobile industry. Danforth has been associated with the Packard Motor Car Co. of Boston as treasurer and assistant general manager with the Henshaw Motor Co., Boston, as treasurer.

C. L. Alexander has been appointed assistant sales manager of the Elgin Motor Car Corp., Argo, Ill. He has been with the Elgin company for a little more than a year in charge of sales promotion. Previously he was connected with the Maxwell-Chalmers and Dodge Brothers sales organizations in Detroit.

George L. Willman, formerly assistant sales manager of the Chicago branch of the Studebaker Corp., has purchased an interest in the John G. Wollaeger Co., Milwaukee, distributer of the Studebaker in Wisconsin, and becomes vice-president.

Henry J. Hall, Jr., formerly vice-president and general manager of the New York Lubricating Oil Co., and **C. M. Addis,** formerly service manager of that company, have become associated with the National Lubricants Co., New York.

W. H. Sackman has resigned as chief engineer of the Light Manufacturing & Foundry Co., Pottstown, Pa., effective March 1. He has not decided as to his new connection at this time.

Ben C. Mott of Chicago has been appointed manager of the Milwaukee branch of the Packard Motor Car Co. of Chicago, succeeding Ray C. Chidester, who resigned Jan. 1 to become Durant distributer in Wisconsin and northern Michigan.

J. D. Cole, manager of the Chicago branch of the Pyrene Manufacturing Co. of New York, has been appointed field secretary of the Automotive Equipment Association.

Charles B. Wilson, president of the Wilson Foundry & Machine Co. and vice-president in charge of production for Willys-Overland, Inc., has been elected president of the Willys-Morrow Co. of Elmira.

George Harrison Phelps, director of advertising for Dodge Brothers, will open an advertising agency of his own, in Detroit, April 1. He will continue to handle Dodge Brothers advertising.

William F. Parish, consulting lubrication engineer, announces the opening of a petroleum analytical and experimental laboratory in the Peoples Gas Building, Chicago.

NEW SINGLE SIX PACKARD

DETROIT, Feb. 8—The Packard Motor Car Co. will announce new models in its single six line this month. The feature will be a lengthened wheelbase. It is expected the new line will be ready for early spring deliveries.

COMMERCE TO MAKE NEW BUS

DETROIT, Feb. 8—The Commerce Truck Co. is preparing to go into production on an 11-passenger motor bus built along the lines of a passenger car. This bus will have four seats.

TO BUILD CLETRAC TRUCK

CLEVELAND, Feb. 9—The Cleveland Tractor Co. is preparing to bring out a ¾-ton truck.

TO PRODUCE JEWETT SEDAN

DETROIT, Feb. 9—The Jewett sedan, all metal and with four doors, will be in production within the next 90 days. It is expected to sell for $1,395.

BEDFORD SPEAKS ON TRUCKS

WASHINGTON, Feb. 9—One of the great transportation problems confronting the country at present relates to the development of motor transport and transportation, in the opinion of A. C. Bedford, chairman of the board of the Standard Oil Co. of New Jersey, who addressed the National Council of the Chamber of Commerce of the United States. He declared highway transportation involved the vital problem of coordinating motor trucks for short haul work with steam lines. He asserted that highway transportation was in its infancy.

Nash Eliminates Truck Distributors

Will Handle Sales Through Dealers—Passenger Car Selling System Is Unchanged

KENOSHA, WIS., Feb. 3—The Nash Motors Co. has decided to eliminate distributors in the marketing of its trucks and conduct its business hereafter directly with the dealers. The new plan will have no bearing whatever on the passenger car business which will be carried on through distributors as in the past. In connection with the announcement in relation to the distribution of trucks, it is stated that a marked reduction in prices on the entire truck line will be made in the near future.

Attractive Discounts Offered

Discussing the new truck policy, this explanation was made by C. B. Voorhis, vice-president and general sales manager:

"During the past five years it has been the policy of the Nash company to market both passenger cars and trucks through Nash distributors, but our experience has demonstrated conclusively that the passenger car business and the truck business are entirely separate and distinct. Therefore, while it will continue to be the policy of the Nash Motors Co. to handle passenger cars through distributors in just the way we have done in the past, we have decided that it is wise and necessary to segregate our truck business entirely from the passenger car business and we announce this new Nash policy for the marketing of our trucks."

It is understood that unusually attractive discounts are being offered dealers.

Trend Toward Elimination Spreads

NEW YORK, Feb. 7—Announcement by the Nash Motors Co. that it had decided to eliminate distributors in the sale of its trucks, emphasizes the trend in this direction. It is similar to that in the passenger car field, but more pronounced.

The General Motors Truck Co. recently has established branches in Atlanta and Charlotte, N. C. It is understood the company will establish other factory branches from time to time.

The Republic Motor Truck Co. is supplanting distributors by factory branches and practically all the business of the White Co. and the International Motors Co. is handled through factory branches.

Some of the other truck companies, on the other hand, are strengthening their distributor organizations and signing contracts with some of those who have given up their former connections.

The companies which are expanding their factory branch organizations contend that they are enabled in this way to give better service, and they also can eliminate some of the evils which attend the taking of used trucks on trade-ins at more than their actual value.

Far East Is Still Unexplored Market

America Maintains Supremacy Due to Ability to Undersell Foreign Competitors

CLEVELAND, Feb. 7—Notwithstanding that the United States has outstripped all nations in exporting automobiles to the countries of the Far East, that section is still a great unexplored market for cars of American make, says Brent A. Tozzer, Cleveland sales-manager for the Niles Tool Works Co. of Hamilton and the Pratt & Whitney Co., of Hartford, Conn.

Tozzer has just completed a 14 months tour of the Far East during which he made a survey of business conditions.

American manufacturers will maintain the supremacy they now enjoy for the reason that they can undersell their European competitors. Quantity production is held to be responsible for the great showing made, and nothing has happened in Great Britain or in Europe in recent months to indicate that industry in those countries will approximate American efficiency in production.

Moderately Priced Car Best Seller

The moderately priced automobile sells best in the Far Eastern countries, although the higher priced cars are being sold to the potentates.

One thing that the American maker of automobiles, who seeks to conquer the Far Eastern markets, must bear in mind, Tozzer says, is that in most of the countries, the weather is extremely hot. The temperature gets as high as 150 and 160 degrees in the sun. Lately there have been complaints that the American automobile has not sufficient cooling facilities in the radiator.

Hot countries are dusty also for a greater portion of the year, and the manufacturer who offers additional protection from dust has a strong talking point.

India with a population of 300,000,000 is awakening and it has many good roads. In fact it is possible to travel by automobile from Calcutta to Bombay, a distance of approximately 1000 miles, over a graded road part dirt and part macadam.

Java Dealers Progressive

Burma has very good roads. Siam has no roads with the exception of Bangkok, where there are good streets and many automobiles.

In the cities of Java the automobile dealers are very progressive. Facilities for service and repairs are excellent. There is an abundant taxi service and the cars are driven by chauffeurs, who have with them an extra man, who assumes some of the duties of a porter. Then the weather is so hot that it requires the efforts of two men to change a tire.

Transportation in Shanghai is by means of a trackless trolley, but the company that operates the tramways has projected plans for a motor transportation system in both city and surrounding country roads. Wheelbarrows, which seat as high as 12 persons and are moved by man power, will be replaced in the country by the motor buses and trucks.

There is an industrial development in Canton and adjacent territory that the American automobile maker must keep in touch with. The ancient walls have been torn down and wide boulevards are being built. These have increased the use of the automobile. In the environs streets are being built wider. The use of the motor car in Chinese streets has been limited because of the narrow and congested condition, but with wide boulevards and streets springing up the automobile is in greater demand.

FINANCIAL NOTES

Goodyear Tire & Rubber Co. of Canada, Ltd., shows accounts receivable, according to its comparative balance sheet as of Sept. 30, 1921, of $3,116,418, against $4,817,535 Sept. 30, 1920, and cash of $870,275, against $130,397 on the 1920 date. The notes payable on the date in 1921 were $330,589, against $4,867,612 in 1920; accounts payable of $447,499, against $1,038,355, and surplus of $300,888, as compared with $1,071,725 in 1920.

Bower Roller Bearing Co. comparative balance sheet as of Dec. 31, 1921, shows cash on hand $35,917, as against $39,136 on Dec. 31, 1920; accounts receivable $30,041, compared with $69,871, and notes receivable $62,931, against $74,688. The company's surplus was $222,480 on Dec. 31, 1921, and $252,579 on the same date the year previous.

Yellow Cab Manufacturing Co. stockholders have approved the 100 per cent stock dividend in class B stock, payable early in March to stock of record Feb. 18.

Illinois Tractor Officers Are Sued for Accounting

BLOOMINGTON, ILL., Feb. 6—Stockholders of the Illinois Tractor Co. have filed suits against the officers and directors, demanding an accounting. It is alleged that instead of the surplus of $121,629, which the defendants claimed existed on June 1, 1920, there was a deficit of $695,470, without taking into consideration some $200,000 worth of notes carried on the books as assets. It is asserted that the books show a loss in the first five years of operation of more than $150,000.

The company was organized in 1912 with a capital stock of $100,000. This was later increased to $2,500,000. The original capitalization represented $50,000 in stock and an equal amount in patent rights. It is charged that the officers entered into a contract to pay Dan F. Garber, a director, 25 per cent commission to sell stock, and that later he was authorized to open an office in Philadelphia to sell stock, for which he was to receive 40 per cent commission. A year ago the company suspended operations.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

Coincident with the payment of the latest issue of Treasury certificates of indebtedness and the interest and dividend disbursements on Feb. 1, a heavy calling of loans was reported during the past week, and call money consequently advanced to 6 per cent in the local market. During the last half of the week, however, the trend was moderately downward and there appeared to be a fairly liberal supply of funds. The range for call money was 4½ to 6 per cent, as compared with 4 to 5½ per cent of the previous week. The rate for fixed date funds was slightly firmer, the quotations for 60 days to 6 months' maturities being from 4¾ to 5 per cent, as compared with 4½ to 4¾ per cent in the previous week. The rates for prime commercial paper remained unchanged at 4¾ to 5 per cent.

The Federal Reserve statement as of Feb. 1, 1922, showed a decrease in the reserve ratio from 77.2 to 76.2 per cent. Total reserves increased $2,663,000, due to the following changes: an increase of $6,280,000 in gold reserves and a decrease of $4,617,000 in other legal reserves.

The New York institution showed a decrease of $42,807,000 in total reserves and an increase of $9,245,000 in total bills on hand.

The recent offering of 4¾ per cent United States Treasury Certificates was oversubscribed by practically $200,000,000. This fact would indicate that banks have an abundance of funds seeking short-term investment.

The net earnings of the United States Steel Corporation as reported for the fourth quarter of 1921 amounted to $19,612,000, this being $24,000,000 less than in the corresponding quarter of 1920. With the exception of the third quarter of 1921, when earnings were $18,918,000, the net earnings for this last quarter of 1921 were smaller than for any three months since the first quarter of 1915, when the amount stood at $12,458,000.

The rally in sterling exchange has carried it to the highest level since 1919, when the artificial pegging which kept the pound sterling at $4.76 was removed and the market set free.

Bradstreet's total number of failures for January 1922 was 2705, which exceeded the hitherto record total of December 1921 by 11.4 per cent and that for January 1915 by 13.7 per cent. The total amount of liabilities involved was $115,301,371, which marked an increase of 42 per cent over the amount reported for December 1921, and of 76 per cent over January 1920.

CADILLAC EMPLOYS 7000 MEN

DETROIT, Feb. 8—The Cadillac Motor Car Co. reports that it now is employing nearly 7000 men in its factory, and that its production schedule is larger by 20 per cent than is usually the case at this time of year.

INDUSTRIAL NOTES

DuBois Rubber & Tube Co. has formerly opened its new factory at Chattanooga, Tenn., and started production. The plant has 30,000 sq. ft. and a capacity of 500 "Red Giant" compression tubes, 500 "Old Hickory" casings and 1,000 "Old Hickory" tubes. It is reported that 400 dealers are under contract to handle the product nationally. M. N. Whitaker is president of the company; L. H. Lightfoot, first vice-president and sales manager and A. H. Harris, recently vice-president of the Cleveland Rubber Corp., second vice-president and manager.

Ajax Rubber Co. reports that actual orders from dealers covering requirements for the early months of 1922 show an increase of 114.4 per cent over similar months of last year. Ajax tube business on the same basis has increased 117.4 per cent, which does not take into consideration important quantities to automobile manufacturers, which business the company has not hitherto had. The company has contracts with Dodge Brothers, Buick Motor Co., Olds Motor Works, Chevrolet Motor Co., General Motor Truck Co. and Haynes Automobile Co.

American Metal Products Co. of Milwaukee, which recently completed a new factory in that city with electric furnace equipment, is enlarging its line of production, heretofore confined to bronze and brass ingots, castings, bearing metal, etc. One of the latest additions to the line is a poppet valve and stem for car and truck engines, made from Ampco bronze, a patented metal alloy. It is claimed that because of the nature of the metal it is not possible for carbon to form on the valve, which will not carbonize, pit, corrode or warp.

Logansport Machine Co.'s general sales offices have been moved from Chicago to the factory at Logansport, Ind. The Frank G. Payson Co., general sales agent for the company's products, will discontinue business and the corporation dissolved. Frank G. Payson will be located at Logansport as manager of sales for the Logansport Machine Co.

Keystone Tire & Rubber Co. has changed the names of its branch stores to Keystone Tire Sales Co., featuring Keystone products exclusively. Heretofore the stores have been conducted under different corporate names. The company reports that its plant at Kingsbridge is being doubled in size to permit on increased output.

E. A. Johnson has been appointed as service manager of the Auburn Automobile Co. with offices at the factory, Auburn, Ind. Johnson has given extensive study to the relations between manufacturer, dealer and car owner, and through his appointment the company expects to intensify the close relations with Auburn owners.

International Harvester Co. is producing fifty trucks a day at the Springfield, Ohio, works and shipments are going forward about as rapidly as the machines are produced. Within the past week a number of former employees have been added to the force.

Victor Rubber Co. tire production at the Springfield, Ohio, plant has been increased from 500 to 700 a day. The daily output will be increased gradually. It is reported that shipments are satisfactory and the outlook for business is growing more encouraging.

C. E. Mason of Concord, N. H., has been appointed sales engineer by the Kelly-Springfield Motor Truck Co. Mason was formerly with the Abbott-Downing Co. All special installations will be made under his direction.

Nash Motors Co. four-cylinder division at Milwaukee has resumed an eight-hour-a-day schedule, affecting about 400 men on the working force, who for some time have been working mornings only.

E. W. Steinhart Co., Indianapolis, has taken over the business of the Oakland Motor Car Co. branch in that city and will sell Oaklands at retail as well as act as state distributer.

Fafnir Bearing Co. will resume operations in the near future at its plant at New Britain, Conn. The factory has been shut down since September, 1920.

International Motor Truck Corp. reports sales for 1921 approximating $25,000,000 compared with $34,000,000 in the previous year.

Vervoort Ball Bearing Co. has acquired the **Superior Roller Ball Bearing Co.**

MASTER GEAR GAGES LOST BY GOVERNMENT

WASHINGTON, Feb. 6—Federal agencies interested in motor transport and its development have lost master gages and dies designed for the construction of gears and other automotive parts. Samuel H. Cook, Vice-President, Brown-Lipe-Chapin Co., of Syracuse, N. Y., has been called into conference with high Government officials for the purpose of ascertaining replacement costs.

The statement that the master gages and dies could not be found brought the estimate from Cook that it would cost $7,000 to manufacture gears, etc, whereas the cost would be limited to approximately $600 if the Government had in its possession the master gages. This simple inquiry may have a reaction from Congress in view of the enormous expense and great difficulties which attended the establishment of a motor transport corps during the war.

SAXON SHOWS DEFICIT

DETROIT, Feb. 9—The Saxon Motor Car Co. shows an operating deficit of $396,263 for the year ended Dec. 31, 1921. Bank loans were reduced from $500,000 to $100,000, and accounts payable from $249,000 to $190,000. The inventories were valued at $457,000, as against $1,770,000 a year ago. Cash on hand was $72,000, as compared with $476,000.

BUS BILL OFFERED

ALBANY, Feb. 9—Senator Downing of New York has introduced in the state legislature a bill designed to give New York City unlimited authority to issue bonds for the purchase of automobile buses. An initial expenditure of $25,000,000 for this purpose has been appropriated by the Board of Estimate and Apportionment.

METAL MARKETS

Steel orders emanating from the automotive industries are more numerous than representative in tonnage. Buyers, large and small, prefer placing repeat orders to committing themselves for large quantities at one time. Consumers are bent upon avoiding adding to what small reserve stocks of steel they generally have and virtually every ton of metal that leaves steel mills is ordered shipped so as to reach destination on about the day when production schedules call for it. Hence automotive consumers are constantly in the steel market these days and expected to remain so over the next two months, especially builders of medium-priced passenger motor cars and manufacturers of automotive accessories.

The steel industry, especially that of the Mahoning Valley is virtually banking on this demand and on its steady expansion as spring draws nearer. In fact, it is the only bright spot on the steel industry's firmament. There is still no sign of an early improvement in the demand for railroad and structural steel and the light export demand for tin plate and tin plate containers is causing the trade to feel somewhat squeamish about a continuance of the demand for tin plate which together with automotive steels has heretofore constituted its chief sustenance.

In many products prices are not lowered "officially" because the general run of orders is so light in tonnage that the producer feels he is entitled to compensation for the retail character of this business and when any really worth while tonnages are inquired for, quoted prices are shaded $1 to $2 a ton without very much effort on the prospective purchaser's part. As usual, a good many market interests are on the qui vive for the Feb. 10 unfilled tonnage statement of the United States Steel Corp. as a sort of compass to the situation. Aside from the fact that the tonnage of unfilled orders on the corporation's books is always without significance unless read with due regard to the shipments made during the preceding month, the statement to be issued to-morrow will fall short in reflecting conditions in the steel industry in general.

Pig Iron.—The market continues weak. Middle West automotive foundries are buying single carload lots of malleable at as low as $18.50.

Steel.—In the Pittsburgh market there are rumors of non-integrated sheet mills having been able to obtain sheet bars at as low as $28. Youngstown interests maintain that sales were made there at $29. Full-finished automobile sheets are firm at 4.35¢. Plate mills are competing actively with sheet mills in the market for blue annealed sheets and rumors have been current in the Cleveland market of business being accepted on 1.50¢ plate basis, which would make the price of No. 10, 1.80¢. Automotive demand for hot- and cold-rolled strip steel continues to the fore, with some sales of the hot variety reported at as low as 1.80¢, base. Hand-to-mouth buying of cold-drawn steel bars continues. Bolts and nuts are only in slightly better demand.

Aluminum.—Automotive consumers continue to show interest in sheet offerings. Metal for foundry purposes is not over-eagerly sought. The market's tone remains unchanged.

Copper.—Amid dissenting opinions in producers' circles as to the wisdom of resuming production, the market is naturally weak.

Calendar

SHOWS

Feb. 6 to 11 — Seventh National Tractor Show and Educational Exposition, Minnesota State Fair Grounds, Minneapolis.

Feb. 6 to 11 — Winnipeg, Can., Automotive Equipment Show, Western Canadian Automotive Association.

FOREIGN SHOWS

Feb. 18-27—Brussels, Belgium, Ninth Exhibition of Agricultural Machines and Implements, Palais de la Cinquantenaire.

March, 1922 — Santiago, Chili, Annual Automobile Show.

April 16—Mexico City, Annual Automobile Show, Auspices of the Automotive Division of the American Chamber of Commerce.

April 22-May 1—Prague, Czecho-Slovakia, Fourteenth International Automobile Exhibit.

May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador. Automotive Section.

Sept. 1922 — Rio de Janeiro, Brazil, Automobile exhibits in connection with the Brazilian Centenary Associcao Automobilista Brazileria.

CONVENTIONS

May 10-12—Philadelphia, Ninth National Foreign Trade Convention of the National Foreign Trade Council.

June 11-15—Milwaukee, Annual International Convention of the Associated Advertising Clubs of the World.

June 26-July 1—Atlantic City, Twenty-fifth Annual Meeting of the American Society for Testing Materials, Chalfonte-Haddon Hall Hotel.

August 28 - Sept. 2 — Detroit, National Safety Congress.

Sept. 18-23, 1922—Rome, Italy, Second Annual Meeting of the International Chamber of Commerce.

S. A. E. MEETINGS

Detroit, Feb. 24, Mar. 24, April 28, May 26.

New Zealand Duty on Cars Increased

Products of "Foreign Manufacture" Must Pay 25 Per Cent Ad Valorem—Britain Aided

LOS ANGELES, Feb. 6—Chiefly for the purpose of encouraging the placing of orders in Great Britain, the Government of New Zealand has increased the general tariff on automobiles of "foreign manufacture" from a 10 per cent basis to 25 per cent ad valorem. There was considerable opposition to the sharp increase in the customs duties on automobiles, according to information received here, the attack largely centering ing around the government's classification of all motor vehicles as luxuries.

Viewed from a per capita basis, New Zealand has been one of the largest purchasers of American automobiles in the Pacific trade area during recent years. With a population of less than 1,300,000, New Zealand in 1920 imported automobiles valued at approximately $13,000,000. Fully five-sixths of these cars were of American manufacture. The imports of automobiles in 1921 fell off considerably, the total value of motor vehicles brought in aggregating only $5,775,000.

Along with the increase in customs duties on automobiles imported into New Zealand, there is a 25 per cent general duty on tires, which hitherto have been duty free.

Questionnaire Brings Out Conditions with Jobbers

NEW YORK, Feb. 3—A certain group of credit men whose companies deal largely with automotive jobbers recently were asked these four questions in reference to business for November:

1. What was the percentage of your December collections of accounts receivable as compared with November?
2. What percentage of November sales did you make in December?
3. How nearly did your December sales approach normal?
4. What is the percentage of your production for January as compared with December?

The individual replies indicated the following conditions:

Company	Question 1	Question 2	Question 3	Question 4 Inc.	Question 4 Dec.
a	44.8%	134.7%	..	150%	
b	57.31	90	..	no change	
c	..	97	80%	no change	
d	45	120	75	.....	
e	67	100	48	no change	
f	..	320	..	160	
g	60	100	50	50	
h	..	70	50	no change	
i	26	101	..		20%
j	70	80	50		50
k	66	90	..	100	
l	63	80	26	50	
m	49	138	44	increase	
n	42	104	86		40
o	40	54	23	82	
p	87	98	55	no change	
q	75	125	80	50	
r	80	79	60	75	
s	71	80	141		5

Less Red Tape in Service Is Urged by Cobleigh

NEW YORK, Feb. 6—Cheaper service to the car owner through better management, less red tape and more efficient labor was the subject discussed at the February meeting of the Automotive Service Association of New York. H. R. Cobleigh, Service Secretary of the N. A. C. C. made an address on "The Uplook of Service" in which he told briefly what the manufacturers had been doing to make it less expensive to own motor cars.

He recalled that nearly every year the prediction is made that the saturation point in automobiles will soon be reached. This prediction was made when there were less than a million cars, when there were five million and is now made when there are nearly ten million. He took the attitude that the saturation point will never be reached because the automobile is more of a utility than ever before and cars will be bought because they are actually needed.

He said that cheaper and better service was being pushed hard by the manufacturers.

Other speakers brought up various points in shop efficiency and economy. The flat rate system was favorably commented on and was credited with having had much to do with the reduction of service prices.

45 Members in New Truck Association

Two Old Organizations Merge Into National Body — Wide Co-operation Contemplated

CHICAGO, Feb. 7—The National Association of Motor Truck Industries which was organized in Chicago during show week, is the outgrowth of the National Association of Motor Truck Manufacturers and the National Association of Motor Truck Sales Managers. It will be limited in membership, preserving the functions of both the old organizations and seeking in every way to cover every industrial activity, promoting the co-operation and success of makers, dealers and operators of motor trucks.

The formation of the association has been under way for several months under the managership of Don Whittaker, who it is understood will continue as general manager with headquarters in Detroit.

When the idea of uniting the two associations was first conceived a committee of six was appointed representing the sales managers and manufacturers. This committee was authorized to draft a constitution and by-laws and was made up as follows:

Representing the manufacturers—B. A. Gramm of Gramm-Bernstein Motor Truck Co., F. G. Elder of Day-Elder Motors Corp., and Moe Cook of Service Motor Truck Co.; representing sales managers—H. T. Boulden of Selden Truck Corp.; J. E. Tracey of Parker Motor Truck Co., and Homer Hilton of Winther Motors, Inc.

The work of this committee was approved at the Chicago organization meeting.

The motor truck industries association will begin to function at once. It is said that the new association will work hand in hand with all the other national automotive associations in every way that will promote the welfare of the motor truck industry.

Nine directors are to be elected at once.

Fifty per cent of the 45 members of the association are members of the N. A. C. C.